BUREAU OF ORDNANCE AND HYDROGRAPHY,

UNITED STATES NAVY.

SYSTEM

OF

ARMAMENT FOR BOATS.

(EXPERIMENTAL DEPARTMENT.)

PART SECOND.

PHILADELPHIA:
PRINTED BY A. HART,
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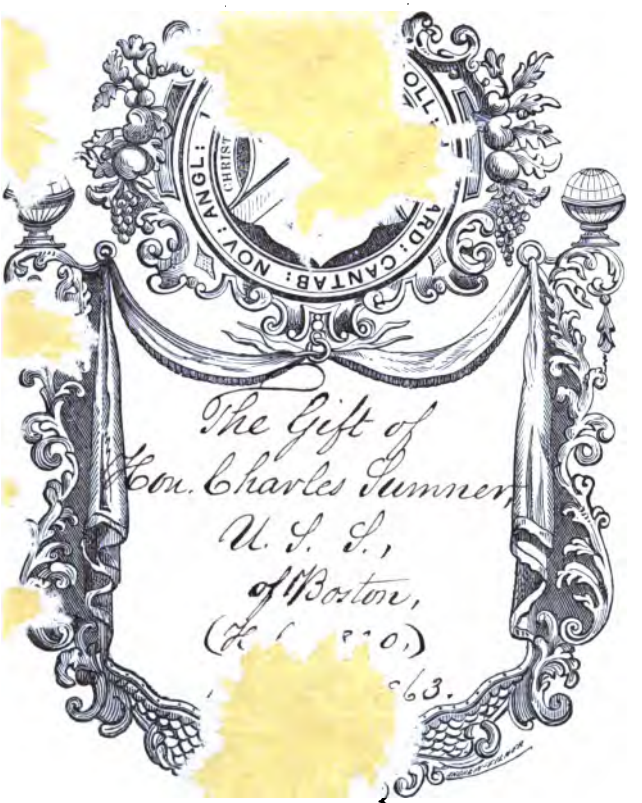
1852.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CHRIST
The Gift of
Hon. Charles Sumner
U. S. S.,
of Boston,
(X . . 0,)
'63.

SYSTEM

OF

BOAT ARMAMENT

IN THE

UNITED STATES NAVY:

REPORTED

TO

COMMODORE CHARLES MORRIS,

CHIEF OF BUREAU OF ORDNANCE AND HYDROGRAPHY.

BY

LIEUT. J. A. DAHLGREN,

ASSISTANT INSPECTOR OF ORDNANCE.

(IN CHARGE OF EXPERIMENTAL DEPARTMENT.)

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OF THE

CHIEF OF BUREAU OF ORDNANCE AND HYDROGRAPHY.

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ORDNANCE OFFICE, U. S. NAVY YARD,
Washington, January 1, 1852.

COMMODORE MORRIS,
Chief of Bureau of Ordnance and Hydrog.:—

SIR: In conformity with the instructions of the Bureau, to report from time to time the progress and condition of the work in my charge, I beg leave to submit the following memorandum in relation to the Armament recently adopted for the Boats of the Navy.

As it cannot be said that any system previously existed, the undertaking necessarily extended from general principles to the minutest practical details. In all these (with the exception of the weight of the lightest piece), Commodore Warrington permitted the amplest discretion, and it will be perceived that the license has been made use of without stint, in every part of the system.

In it will be recognized many appliances made use of from time to time in various description of pieces, modified or not as the case seemed to require; others are presented to our naval service for the first time.

The former generally relate to the *material* or ordnance part of the question; the latter to its application and management, or what may be termed the gunnery branch.

Of these, the most important are the shrapnel, and the arrangement of the boat-carriage; by the latter, the armament can be used on the bow or quarter and broadside as conveniently as ahead or astern; the advantages of both, it is believed, will be very apparent when circumstances may need their application.

The tests of actual service will, no doubt, indicate the existence of imperfections; but such may reasonably be expected in a design made up of so many details as a system of armament, even for boats, and much indulgence may be asked for them, in consideration of the circumstances under which the work has been originated and prosecuted. It was the first essay of all concerned.

As soon as the first pieces were completed, and gave some promise of fulfilling the purpose, they were, from necessity, directed to be sent to ships equipping for sea, and in this way the navy continues to be served; but, as the demand is greater than the means of supply, it is impracticable to furnish full complements of boat-howitzers, and so it happens that, for the present, a ship of any class can seldom have more than one of them.

The present establishment is, therefore, not commensurate with the very moderate wants of the force now maintained at sea; and, in the event of the least

increase, it would be impossible to furnish the additional ships with light artillery for their boats. It is also imperfect in several important details, and thus compels the occasional resort to temporary substitutes, which are always the most expensive methods of executing work not purely contingent in its character.

The whole force of this branch of the Ordnance Department, under my charge, now amounts to one foreman, six mechanics, and two boys; and the machinery, to one boring lathe, one chuck lathe, and four common lathes, two drill presses, and one planer; from which may be inferred the extent at the commencement.

Forty howitzers in all have been manufactured, of which thirty are now in service.

It gives me pleasure to mention the industry and zeal of the foreman and mechanics; the excellence of their work will speak for itself.

While this memorandum was in course of preparation, the distinguished veteran, Commodore Warrington, to whom it was to have been presented, as Chief of the Bureau of Ordnance, was called away by death. He was one of the few left to the service, of that gallant band to whom the navy owes its prestige from the early achievements at Tripoli to the crowning glories of a later and more eventful period.

For more than half a century he trod the path of usefulness and honor, in the service of his country, and he ceased not his labor until the last.

To him the system of boat armament owes its opportunity for existence, and the official sanction of the General Order of December, 1850. The hope may, therefore, be permitted, that its fitness for the purpose will justify his judgment.

I have the honor to be,

Very respectfully, your obt. servt.,

JNO. A. DAHLGREN,

Ass't Insp'r Ordnance.

PRELIMINARY REMARKS.

THE boat armament now introduced into the equipment of the U. S. Navy may be considered as one of the results of the hostilities with Mexico. In the wars that occurred previously, the navy had found an appropriate field for its exertions on the ocean; and heavy ordnance, the seaman's true arm, was looked to as alone worthy of reliance.

Thus moulded by circumstances, it is not surprising that the attractive and legitimate purposes for which a navy is created should have occupied the attention of our seamen to the exclusion of its subordinate and occasional application to other ends in which little could be gained, and reputation might be jeoparded by success as well as by defeat.

When, therefore, the war with Mexico commenced, and the feeble character of its naval force gave no employment to our ships, it became necessary to resort to blockade and littoral warfare as the only mode of operations that was practicable.

The results were highly creditable, though frequently obtained under very disadvantageous circumstances; for, independently of the character of such operations, the naval force of the United States was

in no respect calculated to prosecute them in the most efficient manner. The draught, even of our smallest sloops, was too great for the shoal water along the gulf coast, and the bars that blocked the entrances of the rivers.

From the little necessity that had ever occurred in our service, for boat armament, it can hardly be said that any system existed: a few small carronades may have been occasionally found in the navy yards, but it was seldom that they were furnished to the ships, and, with some rare exceptions, never, perhaps, put to any use.

These difficulties were in some degree remedied by the purchase of small craft from the coasting trade, and the employment of everything in the way of light artillery that was within reach. From the army were obtained 6 pounders and 12 pounders field-pieces, and mountain howitzers; small iron carronades, and a few of the old light 4½-inch howitzers, were also picked up in the store-houses of the yards.

And with such a heterogeneous medley of means the navy performed a most useful service. While the war lasted, so completely was maintained the blockade of the immense line of coast on the gulf and Pacific, as to prevent all issue therefrom; and the commerce of the United States pursued its enterprises in every quarter of the globe unmolested as if no war existed,

an occurrence without precedent in the annals of naval warfare.

On the Pacific coast, the conquest of a large territory by the naval forces stands by itself unrivalled, the only instance of the kind.

The necessity for providing against the recurrence of emergencies, similar to those growing out of hostilities of this character, gave rise to the system of boat armament which is now being introduced into the service as rapidly as circumstances permit. The initial step commenced with a trial in the autumn of 1848. Since that, the progress has been insured by experimenting on each step towards completion. Commodore Warrington, then Chief of the Bureau of Ordnance, always manifested a strong interest in the prosecution of this work, and frequently witnessed the experiments made from time to time. He was desirous, however, that its organization should clearly manifest the purpose of its creation, in which the field operations must, as a general rule, be occasional and altogether subordinate to naval enterprises, or merely auxiliary to those of the land forces.

CHAPTER I.

HISTORICAL SKETCH OF THE HOWITZER.

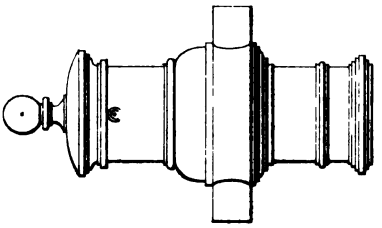
CONSIDERING the various circumstances to which an armament for boats must be adapted, it is probable that the howitzer, with its peculiar system of projectiles, will be found most capable of efficient use. In the present case the metal is determined by the capacity of the boat to carry it, and must also be within the limits that admit of convenient handling, especially in landing it. The solid shot suitable for this weight of piece would be too small in volume to form an efficient shell or shrapnel. And as the latter are the most effective where *personal* uncovered, or but slightly sheltered, is subjected to its operation, it seems advisable to give the metal of the piece that character which will develop most power when applied to its legitimate use.

The early history of howitzers is involved in much obscurity, and there is little satisfactory information in regard to them previous to the close of the seventeenth century.

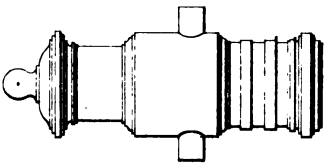
About this time ricochet fire was brought into vogue by the distinguished Marshal Vauban,* and bombs

* Proposed in 1688, and executed successfully at the siege of Ath, in 1697.

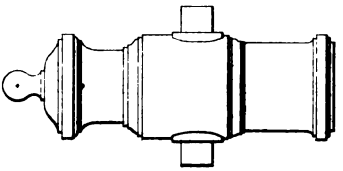
Plate 1.



English Howitzer.
Nerwinden 1693.



French Howitzer.
1795.



Revolutionary trophy.
Yorktown, 1781.

as well as shot, were applied to the practice, for which it was customary then to use very low charges; so that the projectile, with no great range to the first graze, rolled along the ground and finally burst. The mortar being unnecessarily heavy for this purpose, a reduction of its weight gave additional facility for transportation, with some suitable changes in the mode of mounting; and hence, probably, resulted the howitzer then adopted.

Pieces of this description constituted part of the field train of the Dutch in 1693, when they, with the English and other troops, defended a position between Nerwinden and another village, covered by a hasty entrenchment, under the immediate command of King William; they were driven from it by the French after some hard fighting, and eight of their howitzers captured, two English and six Dutch.*

During the 18th century, the piece seems to have been unchanged in form or in the mode of its application, excepting in the artillery of one power.

In the annexed sketch are represented three howitzers:—

The first is an English howitzer, taken at Nerwinden, in 1693.

The second is a howitzer some hundred years later

* Saint Remy, ii. 30.

in date, used in the French army about the commencement of the Revolution and subsequently; the figure is copied from General Durtubie's manual.

The third represents a French howitzer, cast in 1778, at Douay, by Berenger; it fell into the hands of the English, and was surrendered by them at Yorktown, the scene of the closing struggle of the war of Independence. It is now preserved at the Washington Navy Yard.

It does not appear that the French artillerists felt or admitted the necessity of the new piece very readily,* as it was not mentioned among their ordnance as late as 1734, in a royal decree, which fixed the dimensions of "*Canons, Mortiers, et Pierriers.*" At the battle of Fontenoi (1745), there were none in the French field train,† and, according to military writers,‡ it was not until 1749 that some 8-inch howitzers were cast by La Vallière.

It was reserved for Frederick of Prussia to assign the howitzer a part suitable to its power. He is said to have assembled forty-five of these pieces at one position during the battle of Burkendorf (1762). Among the many felicitous conceptions and improvements in artillery of the warlike monarch, none perhaps ex-

* Thiroux.

† Paixhans, Thiroux.

‡ Thiroux, M. Meyer, Durtubie.

erted more influence than this; the howitzer, which previously had met with little favor, at once emerged from obscurity, and ever since has constituted an important part of every field train.

The lessons given by this warrior were not neglected by the recipients. In France, nothing short of an entire re-organization followed, and for this purpose General Gribeauval was recalled and intrusted with the task. In his system, as in the Prussian, the pieces for field service were entirely separated from the siege train, and made much lighter; a 6-inch howitzer was also introduced specially for the field service (1765). This piece was a decided improvement on the 8-inch howitzer, but still, though the step was in the right direction, it was evident that the original idea was not departed from to any material extent.

Nor does it seem from the writers of the day that such was contemplated. General Durtubie* says:—

"The howitzer is a kind of mortar, a little longer than common, and is mounted on a field carriage."

In the wars of the French Revolution and Consulate, the services of the howitzers caused them to be regarded with much favor—but when opposed to the superior efficiency of the Prussian howitzers, or contrasted with the direct and powerful fire of the field

* Manuel d'Artilleur, 1795.

guns, with which they were associated, the common opinion seemed to demand such changes as would enable the shell and its piece to perform the part they were believed to be capable of.

This is expressed in a communication on the subject, addressed by the Committee of Artillery to the Minister of War, in 1800:—

"Ici il n'est pas question de changer, il faut créer."

Which denotes very clearly a conviction that the howitzer of that day, and its method of execution, should give way to something more efficient; and accordingly, the next step shows that ricochet fire was to be merely incidental to the chief purpose, and that the howitzer was no longer to perform a subordinate but a leading part.

In 1803, the 24-pounder howitzer was added to the French field batteries, and, like the 6-inch howitzer, was associated with the 8-pounder cannon. The weights of these howitzers being nearly alike, and the differences in other respects as follows:—

	6-inch.	24-pounder.
Diameter of bore .	6.53 in.	6.00 in.
Length of bore . .	4.14 cal.	5.00 cal.
Weight of shell . .	25 lbs.	16⅔ lbs.
Weight of charge .	17 oz.	
Weight of piece . .	723 lbs.	648 lbs.

The tests of practice, however, and these were soon obtained in the Wars of the Empire, made manifest that, though the new piece was in advance of the old howitzers, yet, like them, it was inaccurate, so violent in reaction as to damage its carriage, and still very inferior in power to those of other nations. The Emperor, therefore, added the captured Prussian and Spanish howitzers to the *material* of his artillery.*

This gradual advance in the French service had been preceded by the Russian artillerists, who, after the Seven Years' war, adopted the long and heavy howitzers, termed licorns.† The power of these more than matched that of the French howitzer, as well as the Prussian and Spanish, and Napoleon had directed experiments to be made with them, looking to some farther changes, when his misfortunes intervened.

In 1813, the French artillery consisted of 27,936 pieces;‡ at the peace of 1815, this immense train was made up of the following *material:*—

The 8-inch howitzer,
The 6-inch howitzer, } Gribeauval.
The 24-pdr. field howitzer of 1803.
The Prussian heavy 6-inch howitzer.
The Spanish field howitzer of 6-in.

* Paixhans.
† M. Meyer.
‡ Instr. d'Artillerie.

Of these, it is remarked by an able writer: "The first three were inaccurate, had little range, and were so violent in reaction as to destroy their carriages, even when strengthened. The 4th and 5th are better; but the Prussian was too heavy for the batteries of divisions. The Spanish 6-in. not so powerful for reserve as its class should be."—(*Paixhans.*)

The Committee of Artillery continued their labors, and one of the results has been the adoption of two howitzers, for the field train, of the longest and heaviest description, the 15-cent. and 16-cent.

The total change now wrought in the character of the piece will be perceived by contrasting the two which use shells of like weight, viz.: The 6-in. of Gribeauval with the new 16 cent. howitzer.

		6-inch.	16-Cent.
Bore,	Length,	4.14 cal.	10.78 cal.
	Diameter,	6.53 in.	6.52 in.
Weight,	Projectile (loaded),	25 lbs.	25 lbs.
	Charge,	17 oz. ($\frac{1}{2}\frac{1}{3}$)	$3\frac{1}{3}$ lbs. ($\frac{1}{8}$)
	Piece,	723 lbs.	1950 lbs.
Initial velocity,		800 feet.	1200 feet.

The charge of the new piece is three times greater than that of the 6-in., and the initial velocity of its shell one-half greater.

Thus it will be seen that the result of severe ex-

perience had made plain the necessity of giving greater velocity to the howitzer-shell, and the French system had gradually, in the course of more than half a century, advanced from the light 8-in. and 6-in. to the long heavy 15-cent. and 16-cent.

Of the five principal European powers, three followed the more recent views, viz.: England, France, and Russia; while two adhered to the primitive idea, viz.: Austria and Prussia.*

" En Allemagne on a généralement conservé l'obusier court, dont on envisage l'emploi en campagne sous un autre rapport que nous le faisons en France: Les Allemands sont donc restés fidèles à l'idée première de l'obusier que ne paraît avoir guère été, à l'origine, qu'un mortier placé sur un affût à roues." (Favé.)

CHAPTER II.

WEIGHT, CALIBER, AND CONSTRUCTION OF THE BOAT-HOWITZERS.

THE weight of pieces intended for boat service should never be so great as to be burdensome, whether carried in the bow or stern, even when circumstances are least favorable, such as in a surf, or a sea-way.

For, although the howitzer can be carried in the body of the boat with more ease than at the extremes, it may happen that the case requires the gun to be in a position for instant action.

The boats belonging to the several rates of ships vary materially in their capacity and structure, and hence arises the necessity for pieces of different weights. The launches are in all respects better adapted to bear the burden of artillery, and to endure the continued shock of its reaction than the cutters, and may, therefore, be properly selected as exponents of the classes to which the varieties of weight should be limited; with the launches may be associated such cutters as approach to them most nearly in size and strength.

It is well ascertained that the launches of frigates and the heavier ships, are fully capable of carrying

forward or aft, pieces as heavy as will be required for any service to which the boats are likely to be applied.

The launch of a line-of-battle ship, for instance, would bear, without difficulty, a piece of 2000 lbs., which amount of metal would construct a 32-pdr. howitzer. But as this class of ships is rarely commissioned in our navy, and a piece so heavy would be too burdensome for the boats of any other ship, it seemed injudicious to divert the operations of a new and limited establishment from the fabrication of pieces required daily to supply the current demands of the classes of vessels most generally used.

A 24-pounder howitzer, of about 1300 lbs., was therefore adopted for the heaviest class as more suitable to the immediate and pressing wants of the navy, as it could be carried by a frigate's launch, if any occasion should require the exhibition of much force in boat expeditions, while it would be no insignificant piece for the launch of a 74, when the necessities of service should cause a ship of that class to be commissioned.

The howitzer, specially designed for the frigate's launch, is the 12-pounder of 750 lbs.; a piece which, in all probability, combines efficiency and mobility in a higher degree for boat operations than any other, and there is little doubt that the experience of active service will confirm this opinion of its merits.

The launch of a sloop-of-war could hardly be expected to sustain the 12-pounder of 750 lbs. with any convenience. Hence the necessity of a lighter piece that would suit the launches of the least of that class of ships, there being no less than three rates of them. For this purpose, the 12-pounder howitzer of 430 lbs. is intended.

Hence results the following arrangement:—

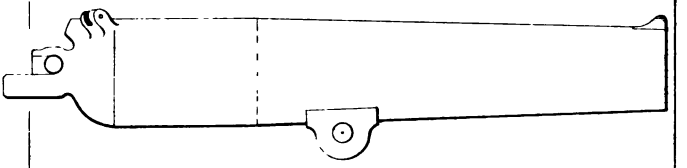
	Launches.	Cutters.	
24-pdr. howitzer,	74's,	———	———
Medium 12-pdr. howitzer,	Frigates,	74's 1st,	———
Light 12-pdr. howitzer,	Sloop of Wars,	Frigates 1st,	74's 2d.

PRINCIPAL DIMENSIONS.

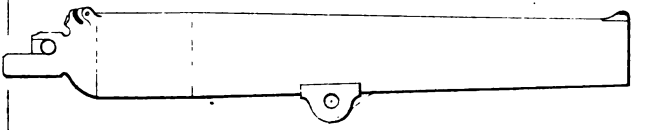
	24-pdr.	Medium 12-pdr.	Light 12-pdr.
	inches.	inches.	inches.
Diameter of bore	5.82	4.62	4.62
True windage	.10	.10	.10
Bore { length including chamber	58.20	55.23	44.00
Bore { in diameters	10	12	9½
Chamber, length	6.00	5.23	5.23
Length from B. R. to muzzle-face	58.20	56.23	45.24
Diameter of cylinder	11.42	9.00	8.00
Diameter of chase	8.82	7.24	6.42
Length of cylinder	15.00	12.00	10.00
Length of chase	43.20	44.23	35.24
From base ring to axis of loop	23.75	24.60	18.78
Hole in loop, length	7.00	5.00	3.60
do. diameter	2.50	2.03	1.50
Weight	1310 lbs.	760 lbs.	430 lbs.

U.S. Boat Howitzers.

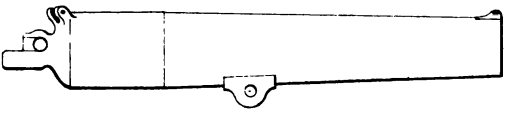
24 Pounder.



Medium 12 Pdr.



Light 12 Pdr.



E.S.Duval & Co.s Lith. Phil.ª

In the general principle of construction, in the arrangement for mounting the piece, elevating, firing, &c., the three howitzers are alike.

Around the charge, the bronze is distributed in the form of a cylinder, extending sufficiently in front of the seat of the projectile; thence to the muzzle it is continued as a truncated cone. The breech-plate is a portion of a sphere, as shown in the sketch.

The bore is terminated by a conical chamber; several reasons might be urged for preferring it to the cylindric; but, so far as concerns these howitzers, the chief inducement was the greater facility for rapid loading, without incurring the least chance of the charge being detained when sent home by the rammer; an expectation which, it is needless to say, considerable practice has fully realized.

The howitzer is mounted by a loop similar to that of a carronade.

The elevation is performed by a screw passing through a lip of the cascabel-knob, projecting for that purpose; the ordinary lever for turning it was found entirely inadmissible for convenient and rapid elevation; and, in lieu thereof, a light disc has been attached just below the thread of the screw. Its edge is coarsely milled, so as to afford a firm touch to the hands.

The lock is a plain hammer perforated at the head, so as to permit free egress to the blast from the vent.

It plays in a lug cast on the piece in the rear of the vent, and is so arranged as in no wise to interfere with the pointing of the piece.

A round tangent sight is made to move in a perforation drilled for the purpose, in the rear of the base ring.

Immediately in the rear of the breech-plate is the knob, bored to receive a breeching if required; a precaution which I have never found it necessary to have recourse to, and would cheerfully have dispensed with any arrangement therefor, if it had seemed sufficiently deferential to common opinion to do so. Deeming it most judicious, however, to avoid this, so long as the addition seemed only to mar symmetry rather than to interfere with any principle, the arrangement for a breeching has been suffered to remain.

PROJECTILES.

The projectiles used in howitzers are shells and canister, to which it is now usual to add shrapnel.

All of these are fixed or attached to their respective charges by means of a sabot.

The *canister* is composed of iron shot, weighing 0.16 lbs. each, and 1.07 inches in diameter, packed in a tin case; the interstices being filled with sawdust, the upper end closed with a wrought-iron plate, the

lower by a wooden block, which is also made to serve as a sabot.

The *shell* and *shrapnel* are cast to gauges differing four-hundredths of an inch from each other; the mean diameter allowing a windage of one-tenth of an inch.

They are made with a hole of one-fourth inch diameter; this is reamed out afterwards so as to receive a wooden plug, into which is placed a fuze.

When the founder delivers the shells and shrapnel, they are first inspected and gauged, then put on a lathe in the ordnance-shop and reamed out.

Being transferred to another department of the ordnance, persons selected for the purpose strap them to sabots; if shrapnel, put in the balls, drive in the wooden plug, and attach the charge. All the details of dimensions and weight are regulated with the utmost nicety, and must not only be executed by practised and skilful hands, but, afterwards, be inspected by an experienced person.

When completed, they are stowed in pine boxes, arranged so that the sabot rests on a ledge in the box, leaving the charge below free from any pressure.

		SHELLS.		SHRAPNEL CASE.	
		12-pdr.	24-pdr.	12-pdr.	24-pdr.
		in.	in.	in.	in.
Diameter*		4.52	5.72	4.52	5.72
Thickness		.70	.90	.45	.55
Thickness at fuze-hole†		1.05	1.35	.75	1.10
Fuze-hole to be reamed to the diameters‡	Exterior	.90	.90	.90	.90
	Interior	.743	.698	.788	.735
		lbs.	lbs.	lbs.	lbs.
Weight		8.4	17	6.4	12

AMMUNITION-BOXES, POUCHES, &c.

The shell, shrapnel, and canister are stowed in boxes of well-seasoned white pine. They are of two sizes. The box contains nine rounds, and the double box eighteen rounds. Each round is accompanied by two primers and one set of fuzes, in a case of water-proof paper, disposed of in the vacant spaces. The boxes are to be stowed in the stern-sheets, or most convenient place, and, though intended to be water-proof, should, nevertheless, be additionally protected by a tarpaulin.

A pouch of stout leather, in the form of a passing-box, is issued to each man, in which is to be carried one

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* Variations allowed to founders—.02 to + .02.

† The interior surface of the reinforce is a plane.

‡ The diameter of the cast hole is .25 in., reamed afterwards as above, the taper being .15 in. to one inch.

round of either kind of ammunition. It is slung over the shoulder by a strap, and inside of the cover is a set of fuzes and two primers, so that any one of the crew is provided with the means of firing one round. In landing, each man has one charge in his pouch, so that, under any circumstances, the piece is supplied with sufficient ammunition for instant action. If the operation is not hurried by the emergency of being opposed at the beach, and the force disembarked is to move to some distance from the landing, one or two double boxes may be lashed under the axle of the field-carriage, and each of the gun's crew carry two charged pouches, a weight (25 lbs.) not beyond the capacity of an able-bodied man. Making, in all, 72 rounds for the howitzer. The pouches are to be replenished from the boxes, and the latter, when emptied, may be thrown aside, if rapidity of movement should become important.

CHAPTER III.

BOAT-CARRIAGES.

EACH one is composed of three principal pieces:—

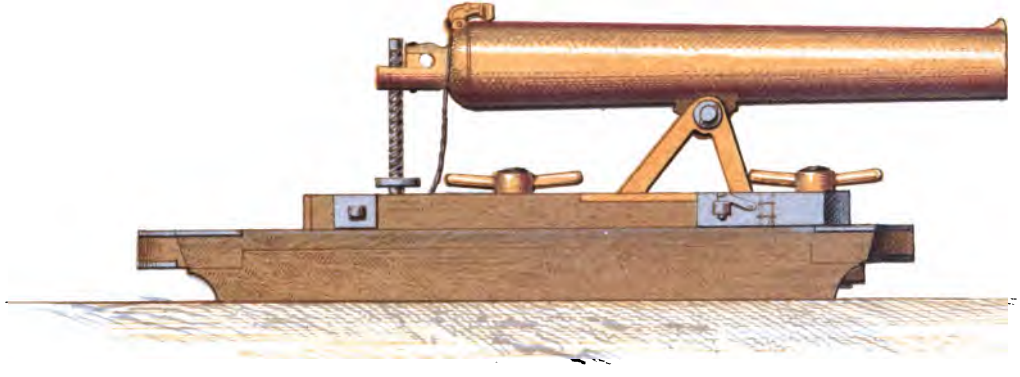
A—The bed which carries the howitzer.

B—The slide on which the bed moves.

C—And beneath the slide, a wooden plate, connected with the bed by two stout bolts.

The recoil is controlled by compressing the slide between the bed and the lower plate; for which purpose, the bolts connecting the upper and lower pieces have a thread above and a corresponding nut with handles. These are set as firmly as the strength of an ordinary man allows, and will then always suffice to keep the recoil within the limits of the slot in the slide. After discharging the howitzer, the compression is relieved, and the piece run out.

In order that this arrangement may invariably perform its function, it is necessary that the surfaces of the carriage to be in contact should be plane, which will be known to be otherwise when the compression is not found to be sufficient to control the recoil. In this case, dismount the gun, take the carriage apart, and examine the surfaces of the three parts. Wher-



Boat Carriage,

and medium 12 pdr.

ever the coincidence does occur, the wood will be worn smooth; let this be removed in the slightest manner, and the surfaces corrected generally, which will be found to reduce the recoil; but remember that, in making a plane surface, it is by no means necessary to make it smooth; it should be as little so as possible for the present purpose.

If the carriage moves out on the slide with difficulty when the compressors are free, it is owing to the guide in the slot having swelled or warped, and will be easily remedied by removing a very slight shaving from its sides.

With all the care that can possibly be taken in selecting seasoned stuff, it is well known that the continued exposure alternately to sun and rain, incidental to sea service, will for a while warp material of the best quality, and therefore it will be necessary, with a new carriage just sent on shipboard, to examine it occasionally and correct the evil.

The carriages of the heavy howitzers have a piece in front of the bed, holding the forward compressor-bolt. A joint connects the bed with it. This is designed to give the facility of reversing the gun without changing the position of the slide. It is done by taking out a small chock in front of the rear compressor, turning back the connecting straps, releasing the rear compressor, drawing the bed slightly to the

rear, so as to clear the attachment, and then pivoting the howitzer round on the rear compressor. The forward compressor is always to be tightened. The operation is readily performed, and the power of checking the recoil undiminished.

Breechings, as already stated, have never yet been used with any of these guns. Should it ever occur that the compression became ineffectual from any cause whatever, a breeching may be rove, and the piece fired as if on an ordinary carronade carriage.

It is not necessary to use tackles to run out the light or medium 12-pdrs., though the weight of the 24-pdr. may possibly require such assistance.

With very little attention, the carriage will be found to perform its part in controlling the recoil even of the most active of these pieces.

The first essay in casting these howitzers here, was a small 12-pdr. weighing 275 lbs., and therefore only equal to thirty-one of its own projectiles. This was mounted on a carriage of the kind now described, and fired with charges of half a pound. The movement allowed by the slot of the slide was 22½ inches, and the average recoil of ten rounds was reduced by the compression to 17 inches.

Increasing the charge to ⅝ lb., and firing four rounds in one minute, the recoils were, 14.01 in., 15.75 in., 19.25 in., and 22.00 in. Average, 17.75 in.

The force of recoil thus resisted may be appreciated by the fact that this piece, being mounted in the bow of a frigate's third cutter, 27½ feet in length, with at least twelve persons in, besides the gun, ammunition, oars, &c., would, when fired, send the boat many yards astern, in smooth water. And yet the application of this force, through the medium of the compression, produced no effect on the frame of the boat—not even the paint over the plank-ends having been disturbed by a hundred rounds, fired chiefly when the boat was under full way.

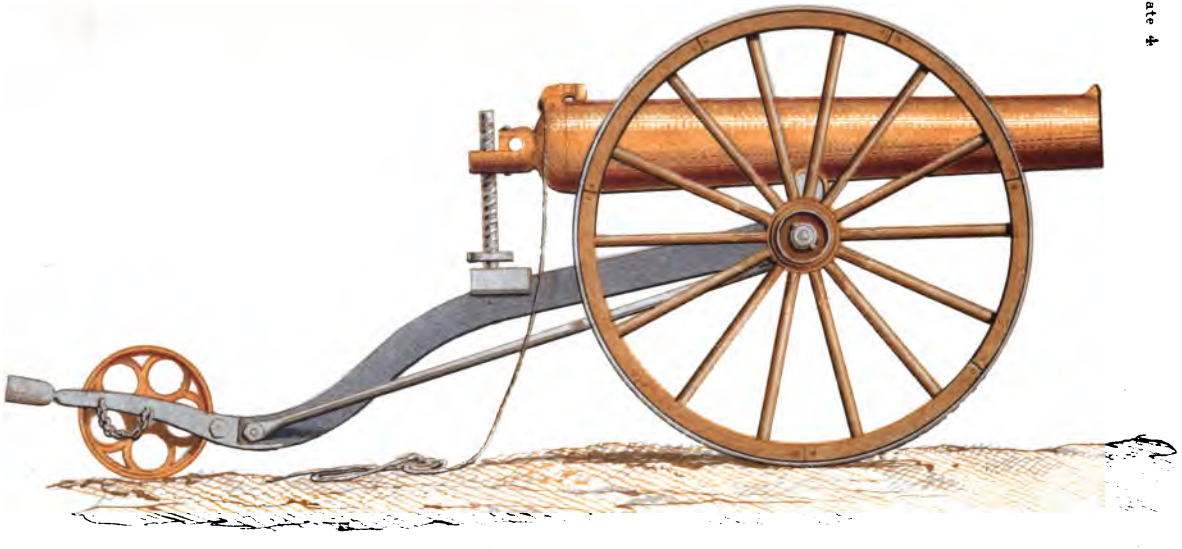
The carriage of the medium 12-pdr. gave the following results (July, 1849): Shell, 10 lbs., charge, 1¼ (⅛); twenty rounds fired; recoils, 16½ in., 17¼ in., 16 in., 23 in., &c.; the slot permitted 29½ in. Piece very warm.

The carriage of the light 12-pdr. gave 15 in., 10 in., 12 in., &c. Recoil allowed by carriage, 29¾ inches.

The greatest rapidity with which it is desirable to deliver the fire of light pieces, is attainable with this mode of mounting.

A boat-carriage being placed on the experimental battery, the 12-pdr. (of 750 lbs.) which it carried was fired readily at the rate of seven and eight times in a minute, and in a few instances as high as ten times, though it was then found dangerous to the loader, as he could not always get away soon enough from the

muzzle of the piece. In this practice, the compressors were always set before firing, relieved afterwards, and the gun pushed out by hand. The limited quarters of a boat, even the largest, afford too little space, however, for such rapid work.



Naval Field Carriage
(12 pdr. of 750)

P.S Duval & Co's lith. Philad.ª

CHAPTER IV.

FIELD-CARRIAGES.

THE 12 pdr. of 750 lbs. is designed to accompany parties of seamen when disembarked. Its field-carriage is of wrought iron, and considerable difficulty was experienced for some time in so arranging it as to endure the recoil. The trail has a small wheel or runner to ease it over any obstacle, and it is found preferable in draught to attach the drag-rope to the trail. The carriage weighs rather less than 500 lbs., and with its piece is drawn readily by a dozen men, a force always disposable from any boat that could carry a gun of this class.

The parts of the carriage are fastened together by screw-nuts. Hence no difficulty ought to arise in taking it apart, if desirable: the two braces which branch from the trail to the axle have nuts on their ends just outside of the axle; these should have particular attention in course of firing. A pin is driven over them to prevent their being started; but this, too, might be forced out by the severe shock. I have never known it to occur, but, as their security is essential, an eye should be given occasionally to prevent even a possibility of accident.

The axle or pin of the trail-wheel may be drawn out, and the wheel itself turned up on the trail, if it should be necessary to moderate the recoil on a smooth piece of ground.

This carriage is obviously designed to operate independently of a limber; an addition which would not only increase the countless variety of articles included in the narrow limits of a ship-of-war, but would be very embarrassing if carried in the boat, already lumbered with the gun, its boat-carriage, field-carriage, ammunition, &c.; and if not, would require a boat for its special accommodation.

If there were an unquestioned necessity for a limber, these difficulties would have to be met in some way; but so far as a judgment may be formed from the requirements of service to which naval light artillery will, in a large majority of cases, be applied, it seems exceedingly doubtful whether there is any reason to justify the addition of a limber to a field-carriage designed exclusively for the ordinary incidents that may attend a cruizing ship.

The chief purposes of naval light artillery may be considered as threefold:—

1. To attack small vessels that are lightly armed, and furnish but slight protection to men.
2. To contend with other armed boats.
3. To cover the landing of regular troops.

In either case, the boat-carriage alone is required to manage the gun.

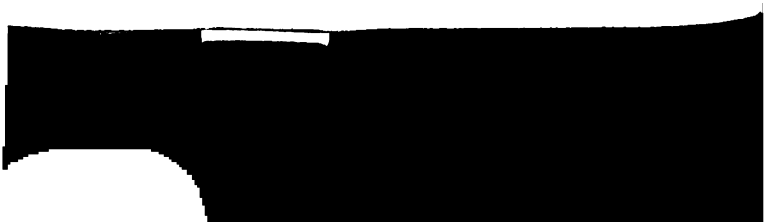
The landing of seamen can hardly be looked on as more than a remote contingency of naval service; one that can seldom occur, and should never be resorted to when opposed by good infantry, or when the object to be attained would take the seamen too far from their boats, which should be the base of operations.

When such an emergency, however; should present, as would warrant the movement of a body of seamen to a distance from the shore, it is supposed that the ammunition slung under the axles, and in the pouches of the men (say seventy rounds per gun), would fully suffice for any case in which the party should be risked.

When the ordinary supply of ammunition would be insufficient, special arrangements for its transportation must be furnished.

The field-carriage provided, it is believed, will offer greater facility for moving easily than the unlimbered field-carriage of the army, which is in no wise calculated to be so used; and when limbered up, is indeed a proper draught for horses, while the navy carriage will seldom be found burdensome to a boat's crew, and at the same time, animal power may be applied, if required.

Referring to the provisions of the French navy for



similar cases, it will be seen that the Mountain howitzer (12-pdr. of 220 lbs.) alone is designed for landing, and that its two "caissons," packed over the gun, carry but twelve fixed shells and two canister. A force, in metal and supply of ammunition, certainly very inferior to that introduced into our own navy.

CHAPTER V.

AMMUNITION, &c.

THE shell is the projectile to which the howitzer has always owed its distinctive character. In the old-fashioned short pieces of the last century, these were placed by hand; and no sabots, therefore, required to preserve the fuze in position, as it passed along the bore from the muzzle, in loading.

Grape and canister were also used when the objects happened to be within their range; but shot were excluded from the howitzers entirely, and never furnished to them.

Shells and canister continue to form part of the equipment of howitzers in every service.

Within the last fifty years, another projectile, the shrapnel shell, or spherical case shot, has been contrived, partaking somewhat of the nature of the shell and the canister, and in a great measure superseding the plain shell, where troops are fairly open to its action.

After some discussion, it is admitted by good authorities, that the conception of this novelty is due, beyond all question, to an English officer, Colonel (since Lieutenant-General) Henry Shrapnel, from whom it

now takes its name, with some, while others term it spherical case shot.

Colonel Shrapnel first attempted to realize his conceptions in 1803, at Mount Bay, and seemingly with sufficient success. For, in the operations of the Duke of Wellington in Spain, we find that shrapnel were furnished to the field-guns, and were used, at the very outset, in the battle of Vimiera (1808).

As might have been expected in the first application of a projectile differing so widely from those to which the artillerymen had been accustomed, the results varied among each other, and produced many discordant opinions. Colonel Napier says, in his account of the siege of Badajoz: "This species of missile, much talked of in the army at the time, was little prized by Lord Wellington, who had early detected its insufficiency, save as a common shell." (Napier, III. 306.)

At this siege, however, notwithstanding the opinion of the commander-in-chief, shrapnel were used when common shells were just as available, and that under an emergency represented to be of the most urgent nature; so much so, that Lord Wellington determined to risk an enormous loss in his storming columns rather than lose time by following the regular procedure prescribed by the engineer's art.

Under such circumstances, it is fairly inferable that

he would insist on the most powerful development of the artillery; and, as his own opinion is stated not to have been favorable to shrapnel, this missile could only have been used because other opinions, to which he deferred, *were* in favor of it.

Subsequently, at the siege of St. Sebastian, the effects were too decided to admit of doubt, and the testimony of the French, who suffered from its effects, is sufficiently convincing.*

In 1811, some cases of the new projectile were captured by the French at the battle of Albuera, and an examination was instituted forthwith; the results of which were rather indifferent; owing, it is said, to the ignorance of the commission in relation to the true function of the shrapnel.

The wonderful events that followed, in rapid succession, until the close of the empire, left military men little time or desire for speculations of any kind. Subsequently, it became incumbent on the powers of Europe to reduce the immense establishments which had so long drained their resources: under such circumstances, it was not to be expected that the attention of officers should be seriously bent on professional improvement, when each one felt that he might, at instant notice, be included within the severe reform

* "Ce projectile nous fait beaucoup de mal." General Rey to Marshal Soult. (August, 1813.)

then in process, and have to seek some other means of livelihood.

A few years rolled by, and the evidences of renovated vigor and means, among the European nations, were noticeable in the cultivation and improvement of their offensive and defensive powers. Among the important objects which then attracted the attention of military men, the shrapnel has occupied a conspicuous place, and to this time it has not ceased to stimulate the invention and criticism of all military services: Norway, Sweden, Russia, Austria, Prussia, Saxony, Wurtemberg, Hanover, Denmark, Bavaria, Holland, Belgium, France, Sardinia, and other countries, have contributed more or less to advance the knowledge of the projectile, and to improve its character and application.

As already said, the shrapnel may be defined to be a combination of the shell and the canister, by which the former is made to serve as a case or envelop to the balls of the latter, carrying them to the desired point near the object, and then opening to permit their egress. Its sphere of operation can only begin where the dispersion of the common canister becomes too great, and its effect feeble; never before, excepting in one case peculiar to naval operations.* It cer-

* Covering a landing.

tainly does take the place, however, of the common shell to a great extent, where uncovered masses are in view.

It is designed to burst the shrapnel in front of the troops exposed to it, and at just such a distance and height as to disperse the charge of balls among them.

Here the difficulty lies. If the shrapnel burst too high, too near, or too far, then it is alleged by the objectors that its power is lost, or so far diminished as to be trifling.

The conditions to an execution so exact are said to be:—

1. In appreciating the distance.
2. In timing the explosion.
3. In adjusting its height above the object.

When bodies are moving with velocities of several hundred feet in an instant, spaces of time which it seems ridiculous to attempt the appreciation of by ordinary means, become not only important, but very plain to the perception, by the differences in the explosion.

The importance of knowing the distance can hardly be over estimated, and the difficulties of making even a tolerable approximation to the truth are not likely to be undervalued by artillerists.

In all circumstances, however, where ordnance is employed, whether in the field or on the water, a

knowledge of the distance is the essential element of correct practice in the application of every species of projectile; and the difficulty, therefore, in estimating it constitutes no greater objection to shrapnel than to shell or shot.

Various means have been proposed by military authors for the determination of distances, but in some respect or another they have been deemed faulty, and none of them seem to have met with so much favor as to insure them extensive trial. For it is indispensable that they should not only accomplish the purpose, but also be available within the brief limits permitted by the rapid action and excitement of battle.

The correction of the fire by previous rounds, is a practical means which is instinctively resorted to by artillerymen on all occasions, but is hardly to be relied on in the field within any reasonable extent, when the observer is near the piece fired from; for the angles subtended by the objects, and most especially those of a plane in perspective, are too minute to afford data to the most practised eye. In departing from the line of fire, however, the means of noticing correctly the errors of range increase, and may be of general utility. Boats in line, therefore, can easily amend their elevation of gun and time of fuze, by the signals of those most remote from them.

It is said that, in the field, shrapnel have not the

same distinctness of effect as shot. The latter throw up the ground and mark the point of impact very plainly; whereas, the shrapnel explodes in air, and affords no data for certainly knowing its proximity to the object.

Be this as it may in the field, it is certainly not the case on the water. The jet of water made by every ball is shown clearly at the ranges of greatest useful elevation; and at the point of maximum effect, not many yards in advance of the explosion, the aggregation of these jets makes a line of foam, quickly and distinctly discernible to the operator.

The adjustment of the fuze to the distance, and the altitude of explosion, are regulated to the elevation; and, therefore, the three conditions to good effect may be said to depend mainly on a correct knowledge of the distance.

Considerable experiment will be indispensable to determine accurately the proper relations of elevation of gun, time of fuze, and height of explosion; and systematic practice must be resorted to afterwards in order to familiarize officers to the use, and enable them to make an effective application, of the shrapnel.

It is in the peculiar dissemination of its balls that the shrapnel promises some corrective for errors in estimation of distance. Following the course of the trajectory, with a velocity not less than that of the

shrapnel at the instant of explosion, they radiate from the case in the form of a cone; and, when projected on the horizontal plane, take an elliptical figure, the greater axis of which coincides with the continuation of the trajectory, and is much elongated, particularly at the low elevations.

There is, no doubt, a point of maximum effect; but, looking to the extent which is covered by this jet of balls, it will readily occur to an observer that, though the maximum effect may be limited almost to a point, yet some departure from this does not reduce the effect considerably, and that a severe execution may take place even if the objects approach the limits of the dispersion.

Almost any practice with shrapnel would illustrate this, if made sufficiently in detail. The following cases, executed here for the graduation of the sights, will serve for the present purpose.

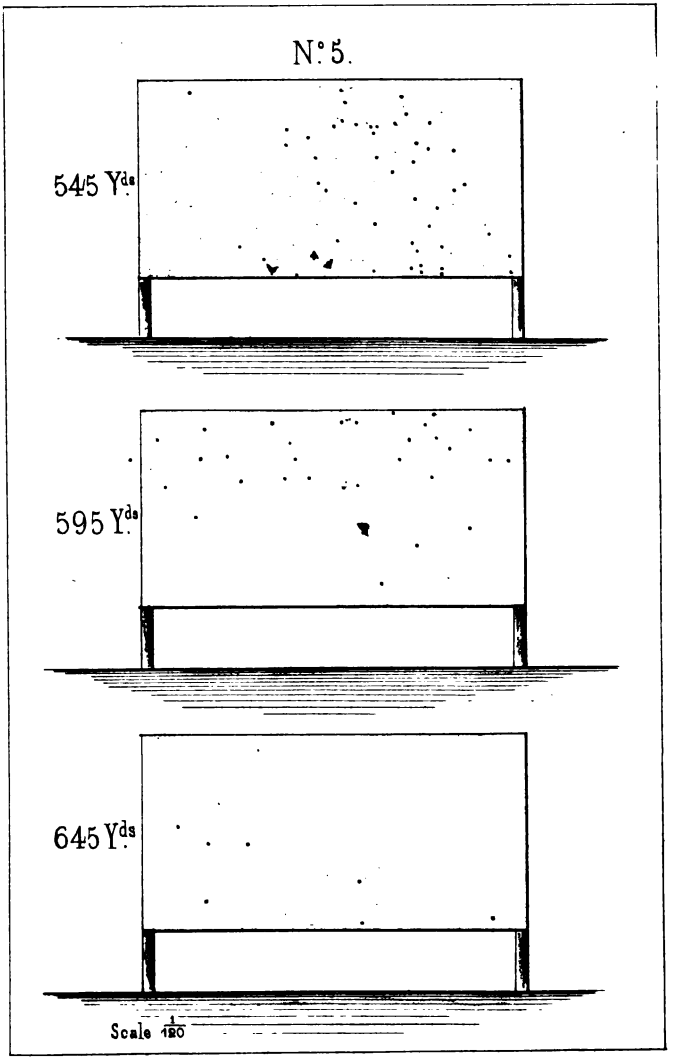
Three muslin screens were stretched on upright frames over the water, fifty yards apart. In dimensions, they were twenty feet long and ten feet high.

A frigate's launch, carrying a 12-pounder of 750 lbs. in the bow, was placed 545 yards from the nearest screen.

Its charges were one pound. The elevation by sight 1.3 inches. The motion of the boat precluded the use of an instrument for this purpose.

Practice with Shrapnel at Screens.

Plate 5.



The shrapnel (charged) averaged 11.4 lbs., containing 80 musket balls (17 to the pound), and four ounces of powder.

The fuzes were two seconds, and such as are issued to the service.

Eight rounds were fired with the following results:—

No. of rounds.	First graze.	BURST			PERFORATIONS IN SCREENS.			Extreme reach.
		from boat.	in front 1st screen.	above foot of screen.	1st.	2d.	3d.	
	yards.	*yards.*	*yards.*	*feet.*				*yards.*
1	580	No explosion			1	1	1	
2		474	71	14¾	16	11	4	1767
3		474	71	16	35	11	9	1582
4	524	536	9	2	25	12	2	
5		497	48	18	51	30	7	1747
6		533	12	4¾	1	1	6	1680
7		558	37*	2¼	1	23	10	1794
8	419	453	92	3¼	13	8	8	1756
		Average . . .			18	12	6	

The gradual increase of the dispersion with the distance is exemplified by the number of balls in each screen, the mean of these eight rounds reducing the effect one-third for 50 yards, and two-thirds for 100 yards.

The results arising then from error in adjusting the explosion, whether from one cause or another, may be

* In front of 2d screen.

inferred from this practice; and, if it should amount to one hundred yards, the object would still be liable to receive several musket-balls.

Still, the explosion should always be made to occur this side of the object, and never beyond it. In the seventh round, the shrapnel passed through the first screen, and burst 13 yards beyond, having only the effect of a shot on it, though it had a good shrapnel effect on the second screen.

The action on ricochet was good, so far as the two instances here given are concerned, and it seems that in the majority of cases the fuze may be relied on when the ricochet takes place on water. In nine instances, only one failure has occurred.

This amount of firing is entirely too limited to permit any reliable conclusion as to the point where the shrapnel should burst in front of the object, so as to insure the greatest effect; generally, it will be safest to keep it well down on the object when using low elevations.

The Prussian general, Decker, expresses the following opinion:—

"From the above data, the distances of 60 to 150 paces in front of the object (50 to 129 yards), with heights of four to fifteen feet, have given good results with cannon, apart from the ranges. Information is not yet had in regard to howitzers; and all that we

Practice with Shrapnel on Ricochet.

Plate 6

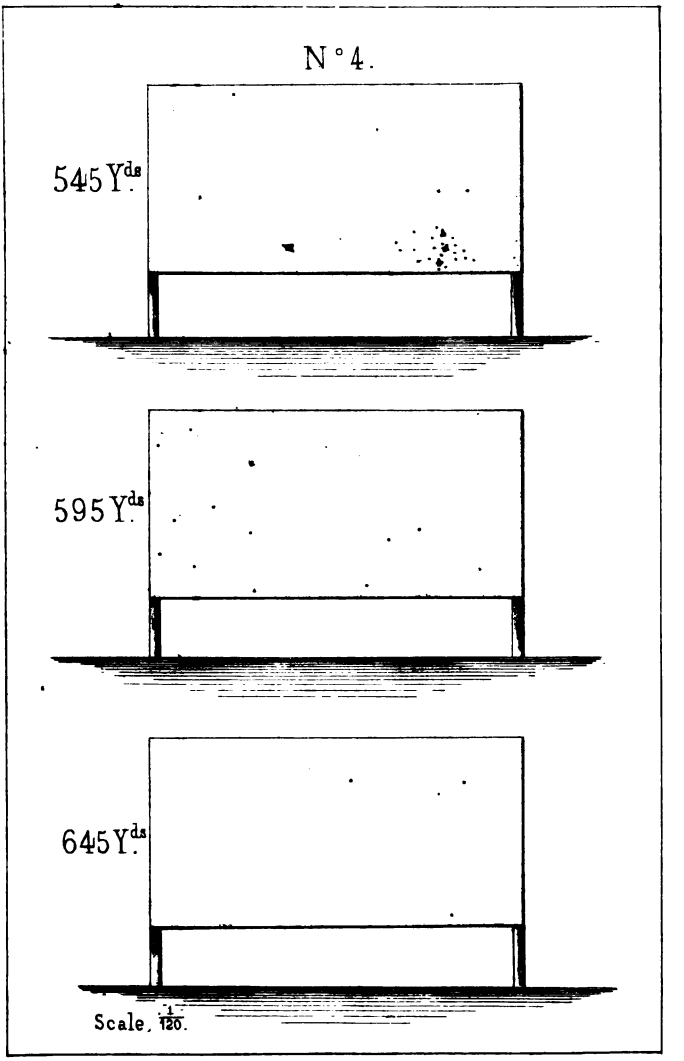
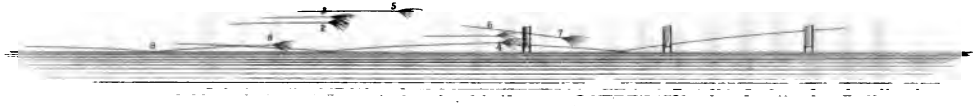


Plate 7.

The Eight Rounds of Shrapnel.



Scale $\frac{1}{2400}$

P S Duval & Co. Lith. Phila.ª

know is, that proper distances vary from 75 to 150 paces (64 to 129 yards), and the heights from ten to twenty feet apart from the ranges."

The "good results," here mentioned, are what might be called close approximations to the maximum effect; and there is no doubt, as already shown by the data of the same writer, that all the distances in front of the object might be increased, and yet the shrapnel produce considerable effect. Material variation is inadmissible in the height, and very fortunately this is always observable distinctly by the firing party, and can be regulated as may appear best.

The 3d, 4th, and 5th rounds of the practice just given, acting on a boat at the distance of any of the screens, would, in all probability, have disabled nearly every man in it. The 2d and 8th would have exercised a very decisive effect. The 6th at the distance of the 3d screen, the 7th at those of the 2d and 3d. The 1st round would represent the result of a solid shot.

In the event of equal numbers on both sides, then, the effect of a simultaneous firing from eight boats, forming the line abreast, might be exemplified by this sketch:—

The force of the balls was sufficient, in every instance, to pass through pine boards one inch thick, placed behind the screens, the distance of the third screen from explosion being sometimes 150 yards.

There is a large array of opinion, on both sides of the question, raised in regard to the availability of shrapnel, of which it may be said, perhaps, that while the English authorities have a favorable opinion of the power of the new projectile, their neighbors across the Channel appear to have entertained the opposite view quite as decidedly. Not, however, to such an extent as to preclude examination into the matter; for there is reason to believe that, for several years, the question has been studiously and closely investigated in France, and it will probably form a part of their equipment before long. In a recent publication,* from a quarter that can leave no doubt of the authenticity of the fact, it is stated: "The shrapnel shell is about to be adopted in France, after the example of several of the European services."

The objections urged repeatedly against shrapnel, and the anticipated frequency of its failure, seem hardly reasonable in view of that admitted to occur in other projectiles commonly used with light artillery, which, with little exception, is immensely disproportionate to the effect produced.

Thiroux,† after citing some cases exemplifying the destruction which sometimes attended the efficient ap-

* Nouveau système d'artillerie de campagne; par L. N. Bonaparte, President de la République.

† Instr. d'artill. 73.

plication of artillery, remarks: "But in contrast with such terrible effects, how many shot are thrown away, especially in the attack and defence of places? We could easily quote many cases where long cannonades have ended in no result."

And the commentator* of General Decker says: "It should not be lost sight of that, in war, there is probably, on an average, not more than one shot in fifty that tells."

In confirmation of these opinions, we are furnished with some facts, by reliable authority, in regard to the number of rounds expended by the French artillery in some of the great battles, alongside of which may be placed the loss, in killed and wounded, assigned by current history to those who sustained this fire.

	Rounds fired by French artillery.	Killed and wounded on opposite side.
Wagram,	80,000	25,000
Leipzig,	200,000	42,600

When it is considered that this carnage was not achieved by the cannon alone, but that the musket, the bayonet, the lance, and the sabre, reaped their full share in the harvest of death, some idea may be formed of the large quantity of shot, shells, and grape that fell harmlessly.

* Favé, 312.

The instances here quoted are two of the severest battles fought by Napoleon, of whom it may be truly said, that he was as incomparable in the use of artillery as of every other arm. At the right time, and at the true point of effort, his matchless genius combined the most immense masses in rapid and precise concentration; and when a crisis arrived, reserves of a hundred pieces were displayed in line with the celerity and force of a thunderbolt.

In face of such want of effect in other projectiles, is it admissible, then, to slight the shrapnel, and to reject it, because experiment proves that it certainly will fail *sometimes;* and in actual service it is admitted that this will occur yet oftener?

Is it not more judicious to improve its operation to the utmost, by thorough experiment and practice, and to look to the results of actual service for a settlement of the several issues raised; neither blindly confiding in the alleged superiority of the new projectile, nor, on the other hand, allowing its probable merit to be depreciated by a too ready skepticism?

CHAPTER VI.

CONSTITUENTS OF THE SHRAPNEL.

In order that the capacity of the shell which incloses the other components of the shrapnel may be increased to the utmost, its thickness is reduccd to the least that will sustain the shock imparted by the charge of the howitzer. Much, therefore, will depend on the quality of the iron, and no effort or expense should be spared to have these shells cast from the best metal, and as uniformly as possible. Such iron as would answer for shot, or even for common shells, would not serve for shrapnel.

Experience, so far, determines the requisite thickness of the shrapnel shell to be about one-tenth of the exterior diameter, which will generally make its weight to be about one-half that of a solid shot of like caliber.*

Besides the spherical form, the oblong has been used in Norway, and the pear-shaped in Wurtemberg.

The charge of powder to burst this case must be the least that will answer the purpose. A few are inclined to think differently, believing that the force

* See page 26.

of the shell's charge has some influence on the velocity of the balls; but the opinion commonly received is that the office of this charge should be confined to rupturing the case. In the 12-pdr. shrapnel, 4 oz. is used by many services; and it is probable that this is fully sufficient for the purpose; it is the charge used in the shrapnel fitted for the service of the army; and, in the practice with the boat-howitzers, no instance has yet occurred in which it has ignited without bursting the shell.

Whatever space is left in the cavity of the case by its charge is to be filled by balls; those of lead are preferable to iron, on account of their greater density, and for other reasons, and are generally used. There is little variation in the size, which is ordinarily that of a musket-ball of 17 to the pound; though trials have been made of balls 14 to the pound, and 22 to the pound.

The shrapnel of our service have 80 ($4\frac{2}{3}$ lbs.) balls in the 12's, and 175 ($10\frac{1}{3}$ lbs.) in the 24's.

The English use $4\frac{1}{2}$ oz. bursting charges, and a less weight of ball.

There is no doubt that the balls in the shrapnel are sometimes agglomerated by being fired. This was found to be the case with some that had been suffered to ricochet in sand, the fuze being extinguished. In one, the balls formed a mass, adhering by the edges.

Though it never has been noticed that, in bursting, the balls failed to disperse, so that the charge of the shell will probably always suffice to separate them in a great degree when thus adhering together. Occasionally, two have been found firmly united when extracted from the oak timber which was fired at; and a large number of the single balls thus obtained had entirely lost their shape, and were curiously slugged.

It is obvious that, as regards the thickness of the shell, the number of balls, and the quantity of powder contained, there can be no material differences of opinion not easily disposed of by a moderate amount of careful examination. The remaining element, however, the fuze, is likely to furnish abundant matter for discussion, and to require all that consummate skill in theory and practice can effect, in order to arrive at a satisfactory conclusion.

It has already exercised the ingenuity of the officers of almost every service, with various degrees of success; but the attainment has yet been sufficiently short of the certainty desired, to make it clear that much more remains to be done than has been done.* A conclusion by no means discouraging, if it be borne in mind that military pyrotechny has received little, if any, systematic investigation; so far,

* Decker, p. 51: "La bonne solution est encore à trouver."

indeed, but one truly scientific treatise has been published in regard to it, and that very recently.

One of the essential points in the fuze is CERTAINTY OF IGNITION.

The surface of composition presented to the action of the flame from the charge of the gun, is sometimes left smooth and hard, or it is covered with a priming, porous and rough, and in other cases it has a small quick-match worked in, so as to create a greater susceptibility to the flame. As yet, the practice here indicates no marked differences between the different modes, failures occurring in one about as often as in the other.

Indeed, if we consider the force and intensity of the flame created by the charge of the gun, and the instantaneous encircling by it of the projectile, it would seem reasonable to suppose that any substance of the least degree of inflammability would ignite, if exposed to it in any position.

If so, the smooth hard surface of composition is preferable to any kind of priming, because it is far less liable to deterioration from moisture, which at sea is of the most pervading character, and hardly to be resisted by the softer and porous compositions and matches.

It is not easy to assign any satisfactory reason for the failures that do occur in every species of fuze yet

tried. That such is the case no one pretends to deny, and the warmest advocates of any system will say no more than that it will fail in fewer cases than any other.* The failures, however, seldom occur with good fuzes to any extent.

The next requisite for an efficient fuze is REGULARITY IN THE TIME OF BURNING.

This seems yet more difficult of accomplishment than the preceding condition, and it is at least quite as desirable of attainment.

The shrapnel fired from cannon may have a velocity in the different parts of its trajectory, amounting to as much as 1200 or 1500 feet per second, and hence a difference in the burning of the fuze, almost inappreciable in time, will be made very perceptible by the variations in the distances at which the explosion occurs; thus, with 1200 feet per second, a fourth of a second will produce an error of 100 yards: if the velocity be 600 feet per second, the difference in distance will be still fifty yards.

To one who happens casually to look on when the process of driving fuzes is being executed, it may seem easy to attain the greatest exactness in the results, and indeed hardly possible to avoid it, and

* Decker, p. 51: "Car même chez ceux qui croient la posséder il se présente toujours ou des ratés ou des explosions qui se font trop tôt ou trop tard."

Decker asserts it to be within the reach of a commonly intelligent pyrotechnist. It is, however, impracticable to obtain a column of composition which, *driven and consumed in the direction of its length*, will not give differences in the times of burning equal to considerable fractions of a second, a fact I have been assured of in the course of testing many hundreds of such fuzes.

Referring to the details of shrapnel practice which Decker, himself no mild critic, holds up with evident satisfaction as something of the best, we here note these very variations in the distances of explosion. They do not escape his notice, but he would have them attributable to some unknown action of the atmosphere on the fuze during its flight. It is not easy, however, to conceive the grounds on which this conviction is based, and none are assigned.

The most certain method of producing regularity of ignition in the fuze is, in condensing the loose composition by a single pressure, and causing the ignition to occur transversely to the layer thus formed.

The third important point is the arrangement FOR SECURING THE FUZE, so that it shall not be driven in, or its solidity disturbed by the shock of first displacement.

When the shell is broken in the gun, it may be difficult, sometimes, to distinguish whether this has been

owing to the force of the charge or to the premature ignition by the driving in of the fuze.

For although the velocities commonly given in our service to shrapnel, from howitzers, do not exceed 1000 feet per second, it is believed that this arises from a supposed liability of the fuze to be driven in by higher charges. It is the received opinion, however, that shrapnel is most effective with the highest velocities, as these are able to maintain most of their movement, and consequently to impart it to the balls, which are supposed to leave the case with the velocity it has at that instant.

Some of the forms of fuze are very liable to be forced in, and sometimes it is exceedingly difficult to guard them against it. Other fuzes may be considered as nearly beyond the possibility of such accidents; and, therefore, present a very strong claim to consideration on this account alone.

A very common opinion finds a third cause for the breaking of the shrapnel in the ignition of the charge in the shell by the violent friction of the balls during the shock occasioned by first displacement of the shrapnel. But the evidence adduced is quite insufficient to sustain the theory; and a more credible cause of the breaking of the shell will be found in the inferior quality of the metal, or in the displacement of the fuze.

The methods taken in various countries to fulfil the conditions essential to a perfect fuze, differ sometimes in principle, sometimes in detail; and the general interest with which the subject has been pursued, and results exhibited before sovereigns and high functionaries, is very significant of the importance attached to it. A brief notice of some of the fuzes may be useful; premising however, that, with the best information respecting the official action of the ordnance authorities of a foreign country, it is not possible to speak with exactness thereof; as, in all probability, the most material points are not made known. The requirements of actual warfare alone may be expected to develop the success which has attended the exertions of those who have labored to perfect the shrapnel. When an inventor has given publicity to his method of constructing and using any particular fuze, there are some reliable data for examination.

The feature principally distinguishing one class is, that its composition is disposed in a column, the axis of which coincides with that of the fuze-hole.

To this order belongs the ENGLISH FUZE, the case of which is beech, bored to receive the composition. Three fuzes accompany each shrapnel, cut to the distances of 650, 900, and 1100 yards; and a fourth fuze which is left to be cut as any unusual circumstance may require. In service, the fuze is selected that may

be deemed suitable to the distance, or reduced to it by a small drill,* and driven into the fuze-hole at the instant.

The NORWEGIAN FUZE, by Captain Helwig, resembles the English in the general principle already stated, but differs from it in the mode of construction. The composition is contained in a paper case, which is cut to suit the occasion, and then placed in the wooden tube, which has been previously driven into the shrapnel.

The SPLINGARD† FUZE, while it follows the general principle, has also its peculiar method of application. The composition is incased in small copper tubes, about 1.25 inches long, and is received by a wooden tube previously driven into the shell; a cork plug at the top of this sustains the head of the fuze, and must exert great influence in preventing the copper tube from being forced in by the first shock. The details are ingenious, and one would be induced to believe that it was very efficient.

These three will serve to give an idea of several more of the same class, which, with certain modifications, are said to have been used temporarily, or otherwise, in many of the European services.

Of another class altogether differing in principle and

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* Fuze-augur. † Captain in the Belgian Artillery.

detail, is the ingenious FUZE OF BORMANN, colonel of Belgian artillery.

The discussion which it has produced might, in itself, be cited as no trifling evidence of merit; but we happen to be in possession of far better, the results of actual practice.

The composition is inclosed in a metallic cylinder, around the axis of which it is displayed in a curvilinear prism; one end opens on a cell communicating with the upper surface, and charged with mealed powder and quick-match; this is to receive the blast from the charge of the gun. The other end of the composition opens into a lower cell charged with grained powder, the action of which opens a communication with the charge of the shell, and ignites it.

The exterior of the metallic case has on its lower end three turns of a stout thread, by which it is screwed into the fuze-hole, the shell being previously charged in full.

The outer surface of the composition is covered by a thin plate of very soft metal, and marked with divisions graduated to seconds and parts of seconds. In action, the outer cell is always uncovered, and the priming exposed; which will give the whole time, when required. If the distance corresponds to a shorter interval, then, with a tool provided for the purpose, the thin metallic slip covering the composi-

tion is cut at the figures denoting the desired number of seconds, and the composition exposed from that point to the priming. The flame will now act instantly on the whole uncovered surface; for, even if it ignite the priming only, it will at once pass along the upper surface of the composition, if exposed by the cutting.

The practice with this fuze has been very extensive, and in a particular instance was unfortunately so *good* as to excite the bitter criticism of an able and rather skeptical writer.* It would seem, however, from the voluntary evidence of a competent person,† that much injustice was done to the ingenious and highly respectable inventor, whose position and character should, indeed, have fairly entitled him to more courteous treatment upon his own statements.

Of the high merit of this fuze no well-founded doubt will be entertained, even by those who, in view of all that can be urged for it, still prefer some other.

Its peculiar principle certainly finds favor in many services, though with some modifications that may have been applied from reason or fancy.

In some, the priming magazine on the upper surface has been suppressed, reliance being placed entirely on the small portion of the condensed compo-

* General Decker. † Major Jacques.

sition exposed by cutting the plate, thus at once rendering nugatory some plausible objections. In others, the lower magazine has been reduced to a small canal, and this, too, seems to answer the purpose of driving the flame into the shell. And again, some slight changes have been adopted in the form of the outer surface of the plate that covers the composition, so as to facilitate the action of the cutting-tool. In another, an effort has been made to dispense with cutting the fuze altogether, by driving the composition in a detached cylinder made to revolve in a cup; the lower surface of the composition moves over a passage that communicates with the magazine in this cup, and transmits the flame at the time given, by turning the cylinder that has the composition.

All these are mere details, tending, perhaps, to improve the action of the essential principle, but in no wise affecting this first element, nor the claims of its ingenious inventor.

To deal fully with such minutiæ, and others of a more speculative character, touching the general subject of fuzes, would require a separate notice, and might too much elaborate this brief sketch, intended merely to explain to those in our own service, who may not have had other opportunities, the system of boat armament now provided, and which they may have occasion to use.

Section of 12 pdr. Shrapnel
For Boat Howitzers U.S.Fuze. – Full size.

P.S.Duval & Co's lith Philad.ª

This passing reference to the theory and practice of other services will suffice to indicate that they are fully alive to the importance of a good fuze. All of them *may* be found effective, and in the average of long practice nearly equal: *that remains to be proved.*

The fuze issued to the U. S. Navy, with the shrapnel, is that adopted in the U. S. Army after long experimental trial by able officers; and, having passed the ordeal of the recent war, is still retained.

It consists of a wooden tube (beech), driven into the shrapnel after the balls are put in, and intended to receive a paper case containing the column of composition.

It is necessary that great care should be exercised in selecting the wood for the plug, and in fitting it to the fuze-hole, which is also reamed very exactly; otherwise, the plug will be driven into the shell by the shock of first displacement, and cause a premature explosion—an accident which I have known to occur frequently when much pains had been used in every particular.

The plug is not set in so far as to be even with the metal of the shell, but is to project 0.1 in. (*Ordnance Manual*, 255); and the paper case, when pressed into the wooden plug with the thumb, will leave out about 0.15 in. of the upper end. (*Ordnance Manual.*)

In the practice here, it has been found surest to drive the paper case in, even with the wooden plug; bruising its edges a little to facilitate ignition. No protrusion of the composition seems required for this purpose, as the flame will often ignite the fuze when cut in two, and the lowest part dropped into the plug; the head being then sunk more than a quarter of an inch from the exterior surface of the shell.

Five fuzes are allowed to each shrapnel, giving times of one, two, three, four, and five seconds: and instead of being distinguished by colors (as in the army), are marked by black bands indicating the appropriate number of seconds; these are packed together in water-proof paper, and just previous to loading the howitzer, one is put into the shrapnel suitable to the time supposed to be required.

If this time does not coincide sufficiently close with either of the fuzes, it can be had by cutting off the lower end of 3″, 4″, 5″, or the upper end of 1″, 2″; these two are bored at the lower end to their assigned duration; which, therefore, would not be altered unless the excision was made above the cavity, and might then deprive the fuze of some power.

The arrangement is very simple in principle, and convenient in actual service; but it requires great exactness and practical skill in those who fit the ammunition, with a critical inspection afterwards; and is

yet liable to some of the objections already enumerated.

The compositions used here for the five fuzes are:—

1″. Rifle powder, perforated .65 inches at lower end.
2″. " " " .30 " " "
3″. " " 14 parts + nitre 3 parts.
4″. " " 5 " + " 2 "
5″. " " 35 " + " 16 "

This information, however, will be of little use on shipboard, where the process of pulverizing and combination is so much less perfect than that obtained by the means used here; and, therefore, would give very different results. The best plan, if the emergencies of service should require it, would be to use mealed powder as a basis, reducing it by nitre in the proportions required.

FUZE PLUGS FOR 12'S AND 24'S.

		Inches.	
Length		1.35	
Exterior diam.	top	.95	taper .15 to 1 in.
	bottom	.75	
Interior diam.	top	.50	taper .05 to 1 in.
	bottom	.4325	

FUZE CASE WHEN FINISHED.

		Inches.
Length		1.00
Diameters	top	.50
	bottom	.45

taper .025 to 1 inch.

The shells for the boat-guns are fitted with the same kind of fuzes, and in the same manner.

CHAPTER VII.

CHARGES—SIGHTS.

THE charges assigned to the boat-howitzers are:—

24-pounders	. . .	2.00 lbs.
12-pdrs.	medium . .	1.00 "
12-pdrs.	light . .	0.625 "

The strength of the pieces would undoubtedly justify much greater charges than these; but it is by no means certain that the carriages, the fixtures, and even the frame itself of the boat, might not be injured by the severe recoil of pieces so light, and even be disabled by the continued repetition of the firing with heavier charges.

In terms of their heaviest projectiles, the weights of these pieces are thus:—

24-pounders	. . . .	55
12-pdrs.	medium . .	63
12-pdrs.	light . . .	36

The severe recoil of carronades will serve as a guide to some idea of what may be safe in these light howitzers.

According to Beauchant and Adye, the weights, charges, &c., are:—

	Weight of Gun.		Charge.
	in lbs.	in shot.	lbs.
24-pounders carronade	1456	61	2
12 " "	654	51	1

There is an evident necessity, so far as grape and shrapnel are concerned, for the highest charges that can be used, even to one-third the weight of projectile: for, in both, the effect depends on the force given by the charge, while low charges will answer for plain shells, the action of which relies principally on the force of the powder contained in the shell; and so long as the latter is borne to the proper point, it is immaterial with what velocity it arrives there, so far as regards its final action when uncovered troops are exposed to it. But when it happens, as it often will in boat expeditions, that the enemy is protected by such quarters as small craft or merchantmen afford them, very low charges will not answer even for the plain shell of such small calibers.

So that, on the whole, the tendency is evidently towards high charges for this species of artillery; and if experience should make it sure that the fixtures in boats, and the boats themselves, will endure the action of higher charges than those assigned preliminarily,

then it will be advisable to augment them. This, however, should not be done on slight grounds, or on hasty conclusions.

SIGHTS.

It seems reasonable that similar terms should be used in marking the sight and the fuze, for there is a direct and inseparable relation existing between the functions of these two agents essential to the perfect action of shrapnel. By one, the elevation is given to the piece which is required to carry the projectile to the proper distance, while the fuze adjusts the explosion to the time which the projectile occupies in traversing this space.

I am inclined, therefore, to consider the English method of marking sights as the best suited to shrapnel, inasmuch as it is the most practical, and therefore best adapted to the excitement of the action and of the actors.

The sight in this method* is graduated to the intervals of time which will carry the projectile to its desired position; and each graduation is accompanied by the two distances which include the spread of the shrapnel balls.

* British Gunner, Adye.

Thus if the fuze be adjusted to 2″, and the piece elevated by the sight, raised to the line on it marked 2″, then the shrapnel will burst about 500 yards from the piece, and spread its balls from that point to a considerable distance farther—effectively, at least 150 yards.

The practice with shrapnel, from the boat-howitzers, has not been sufficiently extensive to express definitively the elevation of piece, duration of fuze, and distances which correspond; but this is now prosecuting as rapidly as circumstances permit.

Even when obtained, these results are only to be considered as general terms that are to guide the intelligent officer to a proper application of shrapnel or of shells, when used upon uncovered troops; there being left in the fraction of seconds, a wide margin for the tact and discretion that are to make his fire more or less effectual.

CHAPTER VIII.

USE OF CANISTER, SHELL, AND SHRAPNEL.

It is the common opinion and practice that grape or canister is always to be resorted to in field guns or howitzers, when uncovered masses of men are the objects of the fire, and are not beyond the distance where the dispersion of the grape, or its loss of force, renders it inefficient. This distance will vary with the piece.

It is also to be remembered that many of the balls will ricochet, and, if the surface of the soil or water be uneven, the effect of the grape will be yet more reduced in distance.

The terrible effects of grape are fully exemplified in many passages of the field of Buena Vista; particularly in the repulse of the division attacking the position held by Washington's battery; and in a yet higher degree when the reserves were concentrated by Santa Anna, towards the close of the day. At that critical instant, the batteries of Bragg, and others, held in check a column of 5000 or 6000 men, and subsequently, assisted by the fire of the Mississippi and Indiana regiments, drove it back with great loss.

When the objects were beyond the effective play of

canister, it has been customary to resort to shells, but, as already stated, it is now proposed to substitute shrapnel, and this involves the respective merits of the two projectiles, and the much-mooted question of superior fitness for the purpose in view.

In both, the due operation of the fuze is an essential element; and, therefore, no advantage can be claimed for one more than the other, as regards the *chances* of total failure or untimely action; each partakes equally in this liability.

Keeping, then, in view that uncovered men are supposed to be subjected to the fire of the howitzers, the chief points for consideration will be:—

1. The probable effect of shrapnel or shell, assuming that each explodes as desired.

The opposing force may be similarly presented to the action of these projectiles, whether disposed in columns or line in the field, or in boats pulling in line ahead or abreast.

The 12-pounder shrapnel contains 80 musket-balls, which are dispersed from the point of explosion, with a velocity not less than that of the shrapnel at the instant. The practice already exhibited indicates the probable number of balls that would be received by the leading boats and by those astern, and the force which they retain would certainly be efficient for more than 150 yards from the explosion, while the lateral

spread would include the same extent and an equal force of penetration for all the balls.

On the other hand, as the material of boats does not afford sufficient thickness for the lodgment and bursting of shell, its effect must be obtained by the dispersion of the fragments among the boat's crew or by sinking the boat; the force of these is derived from the explosion of a charge of half a pound of powder, and the number, on an average, about 12 to 13 pieces; the power of those from the posterior part of the shell will be nearly nullified by the velocity of the shell, while some must receive nearly a vertical direction, and, in returning to the surface, have little more force than that given by gravity. Many of the fragments, therefore, will fail of effect, while nearly every one of the 80 balls in the shrapnel will sweep the surface with a trajectory continued from that of the shrapnel, and with a velocity undiminished by any circumstance save the resistance of the atmosphere.

These views are sustained by the results developed on the screens.

2. The difficulties which interfere with the due explosion of shell or shrapnel are common to either, and, therefore, will exert an equal influence on both.

The shell is intended to burst about the instant of first graze, or while bounding, and a timely explosion is no less essential for it than for the shrapnel; a

failure in exactness just as detrimental to its efficiency. If a column, whether of men or of boats, be under fire, the shell has its whole extent for an opportunity to explode. So has the shrapnel; which may act on the rear of the column from above, or may burst on ricochet, when it may still operate effectually. When a line is the object, the necessity of exactness in timing the explosion to the distance is just as indispensable in the shell as the shrapnel; for the want of extension of the object in the direction which the projectile takes, admits of but little variation in the time of explosion for either.

3. The consequence of exploding a shrapnel prematurely has already been shown by the practice, and it is certain that, even if it occur at 100 or 120 yards in front of the object, one-seventh of the number of balls may be relied on; under like circumstances, the fragments of a 12-pdr. shell would have been nearly harmless.

It is probable that there is little difference in the relative effect when the explosion occurs on ricochet.

Total failure of the explosive effect must be expected with both, if the object is passed before explosion.

It may also be urged that the shrapnel is entitled to the benefit of an opportunity to remove any doubt that may exist to its disadvantage. While shells of light artillery are known to be held in small esteem

by competent authorities, who cite the results in the field thus:—

"Experience shows that when shells burst in the air, even but a short distance from the object, they seldom reach it, and then with few fragments. Hence it is that, for some time, less importance is attached to them as a means of offence against troops, and, consequently, it might happen that shrapnel will gradually replace them entirely. The real effect of the shell as a projectile, and the moral impression produced by the menacing jet of flame from its fuze, which, by the way, is singularly diminished with veterans who have often witnessed the consequences, cannot be considered a sufficient reason for associating it with shrapnel in the equipment for the field."—(Moritz Meyer, p. 399.)

When the hostile force is sheltered, especially by such quarters as small craft or merchantmen afford, or when material of any kind is the object of the fire, then the shell can, no doubt, be advantageously substituted for shrapnel.

CHAPTER IX.

DISTANCE.

WHATEVER be the circumstances under which firing is executed, or the species of projectile used, too much care cannot be taken to avoid excessive distances.

This tendency is not to be attributed to those who led the destinies of our navy in the war of 1812 and previously.

They cheerfully accepted the gauge of decisive battle from the seamen who had been trained upon the maxims of Nelson. Wherefore the point blank, expressed by the horizontal sight of that school, squared well with their wishes and convictions.

But it is generally admitted now, that the changes in ordnance that have occurred since that period will give to skill and experience the means of making gunnery effective far beyond the point blank of any piece. The views derived from observing the results of actual conflict still hold good with some, while the new opinions prevail with many. But it is much to be feared that the want of practice with shot and shells may lead to very dangerous errors in over-estimating the range beyond which the ordinary chances of effect are too few to be reliable.

This may, indeed, prove a most pernicious mischief, pregnant with injurious consequences, particularly as regards a just conception of the power of artillery, which, unproductive of any result when thus misapplied, shakes the faith of those who commit the error, and gives confidence to those against whom it is directed.

The effective range of field pieces (and perhaps of most other artillery) may be limited to 1200 or 1300 yards. Practice, and the common opinion of good authorities, sustain this view. For instance, the French "Aide Mémoire," issued by direction of the committee of artillery (1844), in giving the ranges of bronze cannon, appends this remark:—

"Beyond 1200 metres (1300 yards) there is little accuracy of fire, and it cannot be employed save in exceptional cases. It is only given here with the view of showing the power of the guns."

The table to which this is annexed includes the ranges, not only of such pieces as the boat-howitzer, but of 8-in. howitzers and heavy 24-pdr. cannon.

The text-book of the military school at Saint Cyr, and used also at West Point, says:—

"The fire of artillery should be delivered slowly, when the distance is greater than 600 or 700 metres, in order that it may be executed with certainty. It should cease when the enemy is at 1000 metres or

1200 metres; otherwise he may derive confidence from not sustaining any damage, and push boldly forward. Within 600 metres, the fire should be quick, being then sure; but it is only at a decisive moment that it should be as rapid as possible. By using ammunition profusely, the supply intended for a campaign may be expended in a few hours, and in the mere opening of an affair.

"We may here observe that the rate of firing should be much less than one round per minute, for, the double allowance of an 8-pdr. being 416 rounds, it will be perceived that, by firing once a minute, the whole supply for a campaign will be consumed in seven hours. It is admitted that rapid firing should only be resorted to in some particular cases; and that, generally, it should be executed slowly, so as to make certain, by its accuracy, of producing the greatest effect with the least amount of ammunition.

Manuel de l'Artilleur, by GENERAL DURTUBIE, p. 8.—"But at these elevations (3° and 6°) ammunition is always expended uselessly, because, with long guns as well as with short guns, accuracy is not to be had at too great ranges; and, therefore, noise is made at a manifest loss. In the use of the field-piece, too, the greatest elevation is not beyond two and a half degrees."

Traité d'Artillerie, by COLONEL PIOBERT, p. 421.—

"To produce a good effect, the firing should not be performed at a greater angle than 2° above the ground. Aim directly, but a little low, at distances which do not exceed 900 or 1000 metres; beyond these, fire on ricochet, and at an angle of 1° to 1600 or 1700 metres—which are the limits of this species of practice on the most favorable ground."

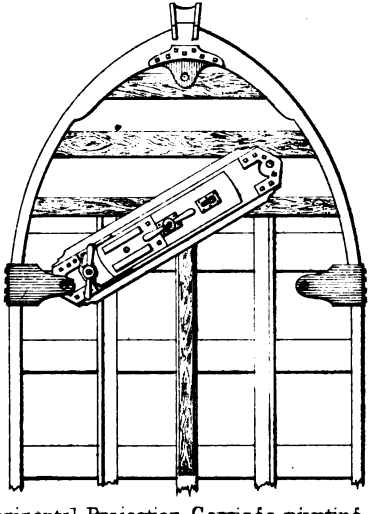
Ibid. p. 422.—"The firing should not be too hasty nor too rapid, especially if there be no certainty of being able to replace the ammunition immediately, or of producing a very advantageous effect."*

Fortunately there is a corrective to this evil, so far as regards the shells and shrapnel of such pieces as these howitzers, which cannot easily be avoided. The duration of their longest fuzes does not exceed 5 seconds of time, and therefore cannot be employed beyond the distances corresponding thereto, which happen not to surpass the extreme limit. It is advisable, however, to make use of the 5-second fuzes very seldom. Not only do the difficulties interpose which arise from the distance and are applicable to any kind of projectile, but, with shrapnel, the ellipse of the dispersion is much contracted on its greater axis, and the fuze itself is the least certain in receiving and retaining

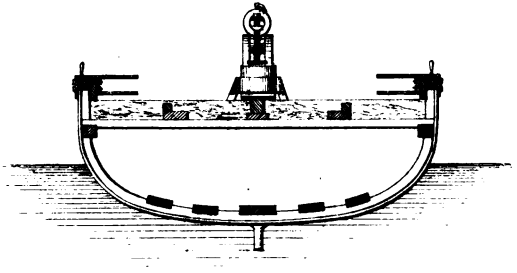
* The pieces here spoken of are field-pieces, and have greater ranges and greater power than howitzers can have.

ignition, as all such fuzes are, in which the composition is weakened in order to give the time; the length being limited by the construction of the shrapnel, which requires the fuze to be kept free from the balls, that would otherwise bruise or break it.

Pivots and Traverses for Bow of Frigates Launch.



Horizontal Projection Carriage pivoting on Port Bow.



Vertical Section

Ad. Cluss, del.

P.S. Duval & Co. Lith. Phil.

CHAPTER X.

EQUIPMENT OF BOAT.

THE appliances for mounting the howitzers in boats, the manner of working them, embarking and disembarking, &c., will perhaps be best comprehended by a description of a frigate's launch, fitted for actual service, which has been used in the experimental practice.

This boat is 34½ feet in length, and has an extreme beam of 11½ feet; built and finished in all respects as usual, and has, indeed, been laid aside as unseaworthy after long service in the navy.

The boat-carriage should be so placed in the bow as to carry the muzzle of the howitzer just above and clear of the gunwale and stem. Two pieces of yellow pine are laid athwart-ship, so as to bear the carriage at this height, and on them it traverses when pivoted at the stem. The warping chocks at the stem and stern-post should not be permanent fixtures, but be arranged so as to be movable when the gun is used. The two iron plates for receiving the slide are welded into one piece, which is firmly bolted beneath the breast-hook of the bow.

When pivoting on the stem or stern-plates, the

howitzer has the sweep permitted by the form of the boat; about a point and a half either way if forward, and considerable more if aft. Two pivot-plates are bolted on each bow so that the howitzer may be trained more or less on the beam; the stem-plates being adjusted first and the carriage fitted in.

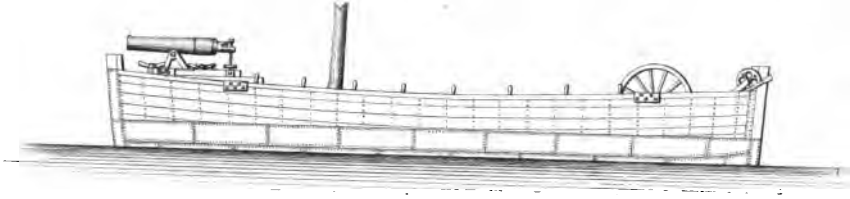
The distances between the bolt of the stem-plate and that of either bow-pivot must be equal to the distances between the holes in each end of the slide, and the pivot-bolts of the two bow-plates also correspond to the same distance. The pivots are thus at the points of an equilateral triangle, which enables a rapid and certain management of the gun in changing its position.

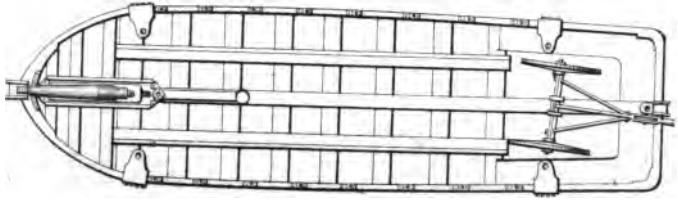
Thus, if the gun be pivoted at the stem, it is brought to either bow by bolting the rear of the slide on one bow, taking out the stem pivot-bolt, and training the fore end to the opposite bow. If it be pivoted on the one bow, it can be used on the opposite bow by bolting the rear of the slide to the pivot-plate on that side, and reversing the gun and its bed on the slide. To sustain the carriage in sweeping, when pivoted to the bow, a piece of yellow pine scantling is placed lengthwise and amidships, mortised into the rear cross-piece.

The arrangements for the stern are to be adapted to the same principle, and the management of the

Plate 19

Frigate's Launch.





P.S.Duval & Co's Lith. Phila.

piece will always be found more convenient in the stern-sheets than bow, as the construction of the boat gives so much more space there.

If a landing is likely to be necessary, the field-carriage is placed forward or aft, according to circumstances. If in the stern-sheets, the wheels are to be down on the platform and the trail laid over the quarter. In landing, the boat will be laid bow or stern off, as may be required by the wind and sea. Two light wooden tracks are laid along the thwarts for the wheels, and one amidships for the trail. Eye-bolts are driven into the bow to receive the hooks of two stout skids, which are connected at the outer end by hooking an iron brace.

When the launch is beached, which, of course, would only be done in a tolerably smooth time, two men jump overboard, each drawing one skid along, and are assisted in hooking them to the bow by two of the men in the boat. Meanwhile, the field-carriage has been lifted to the tracks and run forward to the gun, the elevating screw of which has been removed, and a block placed on the slide, so that the muzzle of the piece may rest on it. A small selvagee strap is passed through the breeching-hole, or around the neck of the pomilion, and a spar put through it. The loop-bolt is withdrawn; two men at each end of the spar lift up the breech of the gun high enough to

permit the wheels of the field-carriage to go clear beneath; which is done until the lugs of the axle are under the loop of the gun; then lower down and bolt it; screw in the elevator.

It will often happen in swaying up the piece that it will turn round a little, so that, when lowered, the loop will not enter fairly into the lugs. The difficulty is easily prevented by thrusting through the breeching-hole a short iron or wooden bolt, by which the piece is slued fair in a moment.

Eight or ten men now jump overboard, and those who remain in, run the gun over the bow on the skids, easing it down by the drag-rope secured to the trail. The men outboard are to keep outside the skids, and moderate the descending movement by bearing up against the spokes. When upon the bottom, slue the piece round and run it up out of the water.

The time required in a launch to shift the 12-pdr. from its boat-carriage to the field-carriage ought not to exceed forty-five seconds; it is commonly done in less time, and even in thirty seconds, when the men work correctly. The time of disembarkation will depend entirely on circumstances. With a good beach, smooth water, and a well-drilled crew, it should never exceed two minutes.

The following are from the memoranda of practice at this yard.

The beach, at high water, afforded fair footing, but not altogether of the best kind. The launch was pulled briskly up to it, the piece fired at the instant of touching, shifted to its field-carriage, landed, run well up on the shore, wheeled and fired.

At the first trial, the time, from fire to fire, was *three minutes.*

At the second trial, *two minutes.*

The results of the third trial are thus stated in the memorandum made on the spot:—

Monday, June 9th, 1851.

Commodore Morris, the present Chief of Bureau of Ordnance, and Commodore Warrington, who then occupied that post, attended by Commodore Ballard, the Commandant of the Navy Yard, embarked in the launch to examine the arrangements for the boat armament.

Shoved off from the wharf about noon, and pulled about half a mile into the stream.

12-pdr. of 750 lbs. in the bow. Opened with shrapnel; the launch head on. Sight 2 in. and 2.2 in. Fuze 2″.

After firing eight rounds, laid the boat broadside-to, the howitzer pivoting on port bow. Sight 1 in. and 1.2 in. Fuzes 1″. Then laid the piece point blank, at the direction of Commodore Morris, so as to try the effect on ricochet.

Pulled in for the beach, and disembarked.

Primer fired on touching the beach. Shifted the howitzer from its boat-carriage to the field carriage. Landed the gun. Each of the men having a round in his pouch, moved up about thirty yards from the water, wheeled, and fired a primer—the houses and people not permitting the piece to be discharged.

Time elapsed from primer to primer in disembarking, 1 *minute* 42 *seconds.*

Re-embarked, going through the same manœuvres reversed.

Time elapsed from primer to primer in re-embarking, 1 *minute* 52 *seconds.*

As a pendant to this, may be given an instance when the bottom was bad, and, through carelessness, a part of the equipment defective. The coxswain reported an eye-bolt broken from the bow (used to hook the skids) just as the launch was about to shove off. It was too late to be repaired, and the chances for a lesson very good.

On beaching, the men jumped overboard as usual. The mud was soft enough to let them well down, so that the water rose above their waists, and sticky enough to embarrass their movements. With all the care that could be used, the eye-bolt left in the port-bow was insufficient to steady the skid, and it canted when the gun was half-way. The left wheel run off

and fell down into the mud. It was not possible to lift so great a weight in such a position, and by hand. The trail, therefore, was turned right over towards the shore; this brought the gun under. The right wheel, being up on the skid, was then turned over, which brought the gun up with its trail in shore. Hooked on the drag-rope, but, so tenacious was the blue mud, that the force of all hands (16 men) was just sufficient to drag the piece up on the beach, though the wheels traversed freely. Large lumps of mud fell from the gun and carriage as it moved. This occupied about twenty minutes. The piece, however, was all right, the ammunition pouches dry, and everything ready for action. In returning, the operation was not delayed by any accident, the mud alone extending the time to seven minutes. That set of men will probably never suffer again for want of an eye-bolt in the bow.

It seems preferable, in landing, not to separate any gun from its field-carriage, as it is not only more difficult to handle the piece without it, but also exposes the gun to being bruised by dragging it along the bottom.

When the water is rough, and so much motion in the boat as to make it hazardous to the men to trust the piece on skids, it can be mounted on its field-carriage, and lashed or slung under the boat before leaving the ship. When as near the beach as the

surf will admit, make fast a stout line to the trail, which send ashore; cut the lashing, and let the piece land with its wheels on the bottom; the men can now drag it up on the beach.

It may be much better than this, however, to use rafts, when the water is not sufficiently smooth to run the piece on skids from the boat. The usual resources of a ship will ordinarily furnish abundant materials for this purpose; and from them it will be no difficult task for seamen to construct rafts fully suitable to the occasion.

CHAPTER XI.

SUGGESTIONS FOR LANDING.

WHEN it becomes necessary to resort to the boats of a squadron to effect any purpose, it is evident that much will depend on the previous training of the men.

If such an occasion should be the first in which they have seen the howitzers hoisted into the boats, it may be taken for granted that they know nothing of their management, and can hardly be expected to use them intelligently or efficiently.

And should any operation result unfavorably, in which the light howitzers have borne a share, neither men nor officers engaged in the affair can be chargeable with blame, when so efficient an auxiliary has been rendered comparatively useless, for want of previous training.

To avoid conclusions so mortifying, it would be well that some exercising should be executed frequently, until the men are conversant with every detail, and, as often afterwards as may seem requisite to keep this fresh in remembrance. Most especially in view of any demand for boat service.

The launch should be hoisted out, and fitted completely with the howitzer, ammunition, &c.; a regular system of manœuvre should then be pursued in shifting the gun to the several pivots, firing a number of blank rounds, or if a mark can be had, using shell and shrapnel; then transferring the gun to its field-carriage, and if a beach is at hand, disembarking it.

The ammunition and equipment of the piece must also be examined at due intervals, particularly to see that the primers, fuzes, and the charges of powder attached to the shell, &c., have not sustained injury from moisture or insects. The boat-carriage, when first shipped, may need slight adjustment, as exposure to the weather will cause it to warp, so that the surfaces are not correctly in contact, or the guide in the slot may have swelled. The remedy for both is easily applied, if taken in time. The nuts of the field-carriage should always be kept well screwed up, and those which secure the ends of the braces outside the axle are to have particular attention.

When the opportunity occurs for actual service, the officer selected to command the launch must have with him another officer to take charge of the howitzer, and a quarter-gunner to look after and serve the ammunition. As soon as the other boats are hoisted out of the launch, the traversing pieces for the boat-carriage are to be placed and cleated, the pivot plates

bolted on the stem, stern, bows, and quarters. If there be a field-carriage, the tracks are to be laid and bolted to the thwarts; the skids laid fore and aft, so as not to interfere with the pulling; the muzzle-block, selvagee for cascable, and spar for shifting the gun, disposed of conveniently, before the launch is hoisted out.

Meanwhile, the ammunition and pouches are to be brought on deck and examined carefully. The shells and shrapnel may now receive their charges of powder, which are—

	Shrapnel.	Shell.
	oz.	lbs.
For the 12-pdr.	4½	0.5
For the 24-pdr.	6	1.0

The chargers are adapted to these quantities. In filling shrapnel, only a little is to be poured in at a time, and well shaken down, until the whole charge is below the fuze-plug. Then close the orifice of the plug with a tow-stopper.

It is indifferent how many shells are charged, because it is easy to withdraw the powder, after the return to the ship, from such as have not been used. But this operation is very troublesome with shrapnel, and, therefore, it is advisable to charge no more than will probably be required for the service. Powder should never be suffered to remain in shrapnel, be-

cause the motion of the balls gradually pulverizes the grain, separation of the components follows, and the charge, assumed to be already reduced to the lowest quantity that will fracture the shrapnel case, becomes too feeble to perform its function.

Spare primers may be taken from the stock of the heavy guns and some match rope. A key, for unscrewing the boxes, must be secured to the becket of each. If spare sponges are to be had, take them and see that they are used fully. The drag-rope for the field-carriage should be stout, and furnished with the proper number of handles.

Everything being conveniently stowed, and the boat properly manned, and otherwise equipped, is ready to shove off.

Supposing that a force is to be landed, the operation should be conducted under the most favorable circumstances that can be chosen, and it should be borne in mind that, in all probability, the greatest disadvantage of all is to disembark when opposed with any firmness; for, in using all the celerity that is practicable and with the best trained men, there must be a few minutes when the pieces to be put ashore are inactive, and the force thus employed is not only fairly exposed to a deliberate fire, but unable to make any return. A very inferior force may, at such a crisis, disable a large number of men, even if it fail

to repel the landing force, and may thus embarrass the forward movement to a very material extent; for, besides losing the services of those who are wounded, some must be left to attend them.

The difficulty of landing when opposed, even by an inconsiderable force, is illustrated by an example that occurred during the last century (1758), when an expedition was sent from England against the French colonies in North America. The force assigned to besiege Louisbourg was 12,000 men, while the French garrison numbered about 3200. The historian states that—

"The governor had taken all the precautions in his power to prevent a landing, by establishing a chain of posts that extended two leagues and a half along the most accessible parts of the beach. Intrenchments were thrown up and batteries erected, but *there were some intermediate places* which could not be properly secured, and in one of these the English troops were disembarked."

* * * * *

"On the eighth day of June, the troops being assembled in the boats before day-break, in three divisions, several sloops and frigates, that were stationed along shore, in the bay of Gabarus, began to scour the beach with their shot; and, after the fire had continued about a quarter of an hour, the boats con-

taining the division on the left,* were rowed towards the shore under the command of Brigadier-General Wolfe, an accomplished officer, who, in the sequel, displayed very extraordinary proofs of military genius. At the same time, the two other divisions, on the right and in the centre, commanded by the Brigadiers Whitmore and Laurence, made a show of landing, in order to divide and distract the enemy. Notwithstanding an impetuous surf, by which many boats were overset, and a very severe fire of cannon and musketry from the enemy's batteries, which did considerable execution, Brigadier Wolfe pursued his point with admirable courage and deliberation. The soldiers leaped into the water with the most eager alacrity, and, gaining the shore, attacked the enemy in such a manner that, in a few minutes, they abandoned their works and artillery, and fled in the utmost confusion."—(SMOLLETT'S *History of England*, II. 387.)

It will be noticed that:—

1. The British force was vastly superior to the French, who necessarily could spare but a small part of the garrison to defend the landing.

2. There were intermediate places not properly secured, and probably could not be for want of men. Here the English troops disembarked.

* Grenadiers, light infantry, and Fraser's Highlanders.

3. The division was composed of the best troops, and led by the heroic Wolfe.

The only disadvantages were a considerable surf, and a rocky shore, reached, in some measure, by the cannon of the nearest entrenchments.

And yet these were so nearly able to counterbalance the immense superiority of the attacking force, that General Wolfe, in a private letter to Colonel Rickson, remarks:—

"Amongst ourselves, be it said, that our attempt to land where we did, was rash and injudicious, our success unexpected (by me) and undeserved. There was no prodigious exertion of courage in the affair; *an officer and thirty men would have made it impossible to get ashore where we did.* Our proceedings in other respects were as slow and tedious as this undertaking was ill advised and desperate; but this for your private information only."

A very significant commentary on the chances to which an expedition is exposed in attempting to land in a surf in the face of an enemy, especially when it is remembered that no officer would have been more likely to command success, in such an enterprise, than the intrepid young general who led the men in person. He not long afterwards ended his bright career at Quebec, at the early age of thirty-two.

In perusing the letter of Wolfe, one is led to note

how slight the chance on which success depended, and how easily the brilliant picture of the general historian might have been converted into a very dismal sketch, by reverses in a matter so trifling to him, and his authority, as seemingly to be beneath their notice.

Judicious means, therefore, must be used to get the expedition ashore without opposition; avoiding it, either by keeping out of sight, or, if seen, by pulling rapidly to some point which can be more readily reached by the boats than by the party ashore, or by dividing the force, and making false attacks upon several points.

If, however, such attempts are unavailing, then it only remains to land promptly in the face of the enemy, and, to this end, that part of the beach must be selected where the footing is most likely to be firm, the bank gradually shelving, and the bottom freest from rocks and stones, least exposed to the surf, and, most especially, where no cover of any kind for the enemy exists within some hundred yards of the shore, and consequently nothing to protect them from the free play of the guns.

Rafts may afford the best means of landing field-pieces in the surf. These are readily put together on shipboard with spare spars, gratings, &c., buoyed by gang casks, breakers, &c.

The pieces are mounted on their field-carriages with

the ammunition boxes at the axles well provided against wet, and secured so as not to start with the motion of the raft. The seamen attached to the piece accompany it with their pouches slung and a round in each. Two stout grapnels are stowed on the raft.

The boats and rafts, which carry the landing force, should be in the middle of the line. The covering launches, carrying the 24 pdr. howitzers, should be placed at each extremity of the line, and somewhat in advance, so as to be in position before the landing force is near the shore. Generally, it will be best for them to come within good canister range of the beach, say 200 to 300 yards.

The disposition of the covering force is of the greatest importance; it should be so arranged as to give free scope to the advance of the other boats while it operates against the shore until the landing is fairly established.

At the proper time, the whole force pulls in for the designated landing, according to the plan of the commanding officer. The rafts towed in by the most powerful boats.

If there be a surf running, the rafts and launches will let go their grapnels outside of it; taking such positions as will enable each to perform a proper part, and veering in as desired. As the boats swing round,

the covering launches will open on whatever may be sufficiently near to molest the landing force.

The rafts with the field pieces now veer rapidly, so as to approach the shore; and, the moment they touch, the men run the pieces on the beach, previously loaded with canister, if the position is critical and the enemy within a short distance; otherwise, they load after landing, according to circumstances.

Meanwhile the other boats dash at the shore, and, when near enough to it, the marines and seamen jump into the water, muskets loaded and bayonets fixed, and are disposed so as to suit the emergency. If the enemy crowd down to meet the boats, the howitzer forward may send a round or two of canister among them, immediately previous to the men leaving the boat.

At this important moment all will depend on the activity and training of the seamen, acting as infantry, and the rapid perception of the officers who *lead* them. In handling the howitzers, coolness and precision *only* are required; not a round must be lost; and great care by the covering launches used, to avoid injuring one's own people as they approach the enemy.

It will be seen that if the opposing force attempts to close with the landing party, its line is taken obliquely by the 24-pdr. howitzers; and, if not checked

by this, they will in a few minutes be encountered by an additional play of canister from the field howitzers and the musketry.

The first measure of the force disembarked is to move rapidly forward to fulfil the object of the expedition. The crew of each piece carrying one or two pouches with fixed charges and ammunition chests lashed under the axles, if required.

The people in the boats will at once prepare to receive the men who are ashore, when they shall return. The boats or rafts, which have been beached, must therefore be floated, hauled out, and held by a grapnel head off, veering in as far as may be convenient.

Clothes-bags, bread-bags or barrels, filled with sand or earth, and piled up, will constitute a ready and defensible barricade; and, with a howitzer or two, will make a good rallying point, and cover a re-embarkation or reinforcement.

Suitable arrangements should always be made for re-embarking, and demand even more care, in selecting the proper spot and in giving security to the operation, than for disembarking; because the failure in this case will be far more disastrous, as it will compromise the lives of many men, and may cause the capture of the whole, as well as of the boats thus left without sufficient numbers to defend them; whereas

the repulse of an attempt to disembark need not involve the loss of the party.

An instance of what may result from not properly providing for re-embarkation, is shown in the following account of an expedition which the English landed on the French coast in 1758.

"The Bay of St. Cas was covered by an entrenchment which the enemy had thrown up, to prevent or oppose any disembarkation; and on the outside of this work there was a range of sand hills extending along shore, which could have served as a cover to the enemy, from whence they might have annoyed the troops in re-embarking: for this reason a proposal was made to the general that the forces should be re-embarked from a fair open beach on the left, between St. Cas and Guildo; but this advice was rejected."

The rear guard of 1500 men was attacked by the French, and 1000 killed or taken, including General Drury, although the fire from the frigates seems to have swept the ground very destructively.

The historian follows the account of this expedition with some remarks, and says:—

"Should it be judged expedient, however, to prosecute this desultory kind of war, the commanders employed in it will do well to consider that a descent ought never to be hazarded in an enemy's country, without having taken proper precautions to secure a retreat;

that the severest discipline ought to be preserved during all the operations of the campaign, that a general ought never to disembark, but on a well-concerted plan, nor commence his military transactions without some immediate point or object in view; that a re-embarkation ought never to be attempted, except from a clear open beach, where the approaches of an enemy may be seen, and the troops covered by the fire of their shipping."—(SMOLLETT'S *History of England*, II., 378.)

In all expeditions where it may be necessary to act ashore as well as afloat, it will be found that the 12-pdr. of 750 lbs. unites more advantages in this two-fold capacity than almost any other howitzer. For landing, and for movements over ground with a good stock of ammunition, it has the decided advantage of the 24-pdr., which, from its own weight and that of the ammunition, would frequently be unmanageable. And, as regards range and power, it is far above comparison with the light 12-pdr.

As artillerymen, good seamen are not easily excelled, and, therefore, in maintaining a position, may be fully relied on to do so, as long as the means furnished permit. A memorable instance of their capacity in this way occurred at the battle of Bladensburg, where choice British infantry were unable to carry, by a front attack, the pieces manned by Commodore

Barney and his sailors, and were forced to effect their purpose by a flank movement.

Their habits and training, however, do not fit them for manœuvring with facility, or in compact order; and it would be unwise, therefore, to expose them voluntarily to measure force in the field with disciplined infantry. Whenever necessity should lead to such a measure, it should be based on the unquestioned superiority of the sailors, in numbers and appointments; and all the marines should accompany the expedition.

It is important, in coming under fire with a division of boats, that they should not pull in line ahead towards it; and if in line abreast, that they should be so far asunder as not to permit the scattering of canister or shrapnel to cover more than one boat. Otherwise, it will hardly be possible to avoid suffering from every round. The fire of the whole line should, on the other hand, be concentrated on the principal masses of the enemy.

The admonition given by a good authority* for the *general* service of artillery, will be found particularly applicable to that of the boat armament.

"To develop the full effect of artillery, its fire should be delivered at good range, with coolness and

* Instr. d'Artill.

judgment; every impetuous outbreak of mere courage being forbidden."

In all the details of ordnance, large and small, there has been vast improvement of *material*, since the first introduction, but no corresponding advance in the training and practice of the *personal;* precipitate, and ill-timed firing is just as common now as it was in the most primitive epochs of artillery, and unfortunately most of the inventive power of the present day tends rather to increase than to diminish this evil.

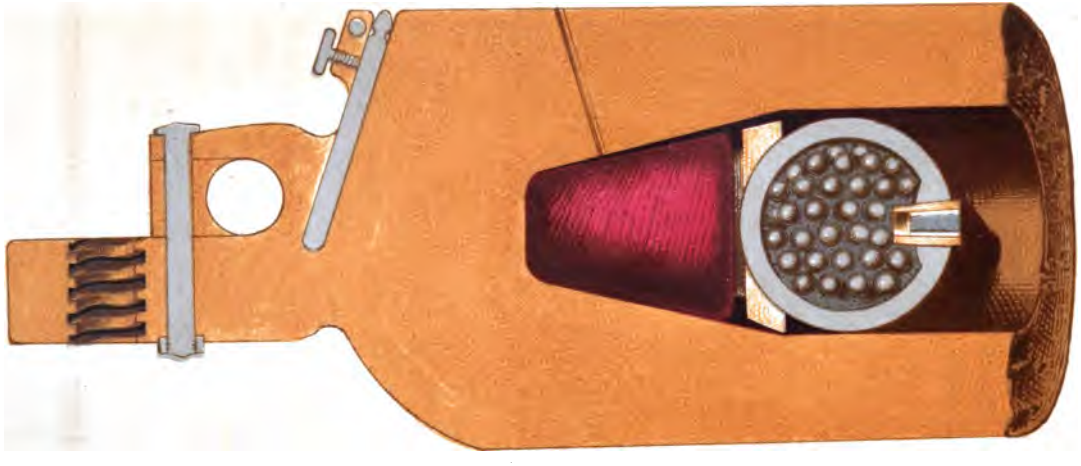
Every battle can furnish its full share of the mischief produced by the indiscriminate firing of artillery, though the fact may not always be recorded. Here is a case where inexperience could not be assigned as an excuse:—

"About 8 o'clock, the enemy's columns began to pass the fords (of the Bidassoa), covered by the fire of their artillery; but the first shells thrown fell into the midst of their own ranks, and the British troops on Santa Barbara cheered the French battery with a derisive shout."—(Napier, IV. 222.)

Sometimes entire defeat has resulted from this seemingly incorrigible vice.

Wherefore, however excellent the skill of the officers, and the training of the men, there is a limit to the rapidity with which the fire of artillery should

be executed; beyond this, no certainty can be expected, and the results must be those of the merest chance.



Section of Boat Howitzers.

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CHAPTER XII.

HINTS FOR GENERAL SERVICE.

THE points of chief interest in relation to the proper condition and management of boat armament, may be briefly condensed as follows :—

FOR PROJECTILES.

The wooden plug to receive the fuze of shells, must be examined to see that it is free from cracks, and a gauge inserted into the orifice, to be certain that its dimensions have not been altered.

See if the sabot be sound, and that the tacks hold the straps firmly.

Examine the twine which secures the cylinder to the sabot, and see that the knotting remains good; feel if the charge have caked, or if there be any appearance of moisture about the flannel cylinder, or perforations by insects. If powder dust should have filtered through, brush it entirely away: premature explosion may arise from a neglect to do this.

Imperfection in any of these particulars should be remedied immediately; and, if necessary, the round taken apart and refixed.

AMMUNITION.

The primer, to be in good order, should have the barrel of the quill free from splits: the joint where the wafer is connected with the quill sound, and the shellac adhering there and on the whole wafer; and particularly the tipping at the end of the quill, intended to keep the moisture from the charge therein, and to prevent small grains from dropping out.

If the paper covering of the fuzes is unbroken, and the shellac coating not cracked, the fuzes themselves are probably in good order.

The boxes containing the ammunition should be close at the joints, and perfectly tight when the lid is screwed down.

EQUIPMENT.

Examine the equipments of the howitzer; the lock and sight should move freely and truly; the laniard be sound, and the elevating screw clean, but no hard rubbing ever permitted in order to make it bright; the thread is worn by it, and the screw will cease to prevent the jumping of the breech in firing—a very important consideration. At sea, the continued motion of the ship will tend to create this defect; therefore, the elevator should ordinarily be removed and

the breech of the gun be supported by a block of wood.

Do not lose sight of the sponge; a good one is a prime essential in service.

Look after the appliances for shifting the howitzer from one carriage to another; the block for the muzzle, the strap for the pomilion, and the spar, which also is to serve for the socket in the trail of the field-carriage, so as to point the piece.

The boat-carriage is to be examined carefully; it must work freely when not compressed; and be as firm as if it were one piece, when the compressors are set hard. In correcting the errors incident to warping, be careful to remove but very slight shavings; two small buttons underneath the lower plate prevent the bolts from dropping down when the compression is relieved; they cannot be dispensed with. Take care that grease is never applied to the surfaces of the slide or bed; the compressors in that case will not control the recoil. The carriage should be protected from the rain and sun when not in service.

It is advisable not to take the field-carriage apart: nuts and pins may be lost through some of the many contingencies of sea-service, and then trouble and delay will occur, when perhaps it may be most desirable that all should move with the greatest dispatch. Examine the nuts occasionally; they should be firmly

screwed; those which hold the braces outside of the axle will demand particular attention.

When the pivot-plates are removed from the launch, so as to stow the other boats, they and their bolts and nuts should be tallied and stowed in the store-room, the wooden traverses for the boat-carriage, the tracks and skids for the field-carriage put away safely and where they will be at hand. Look out for the eye-bolts in the bow, to which the skids are hooked.

In serving the howitzer, the practice here has always been to moisten the sponge, and though it differs from that common in the land service, there seems to be much to recommend it; especially in this, that the least trace of fire must be extinguished.

In the course of three years' operations with these howitzers in every variety of rapid and slow firing, no accident has yet occurred from premature explosion.

In firing, *never* jerk the laniard; having just strain enough to straighten it, draw with a sharp, quick blow, and continue the force until the hammer is felt to be down. Perhaps in a thousand primers not more than four or five will fail, whether it rain or shine, provided the water does not reach the charge. The primer will go through the flannel without pricking.

Never fire faster than you can aim fairly, and surely; and in view of the tendencies to random shooting, still so prevalent, it would be well, in service as well as in exercising, to pause after aiming, and give a chance for another look at the object. When you see those objects closing on you, at a couple of hundred yards, then lay your gun point blank for the ground at their feet; and if you can make six or seven discharges in the minute that follows, so much the better. It has often been done eight times in a minute in the practice here, and witnessed by many officers and others. *At such times canister only is wanted.*

If the piece must retain position, two men of a side, by taking hold of the spokes, will check the recoil and run the piece up to its place. In rough, or soft ground, the trail should be carried in recoil by its wheel or runner; but not when the ground is smooth and firm.

CONCLUSION.

THE application of a naval force to the purposes of littoral warfare can only be considered as incidental to the general purposes for which a navy is created, and the character of such operations is necessarily limited by that of the force, and by its strength. The squadrons which the navy might collect from its present number of ships would seldom be able to land a sufficient number of seamen to admit of acting, excepting as subsidiaries, against the forts, posts, or detachments that would be found along the shores of any civilized nation at war with us, even admitting that the adaptation to the field, of the force landed, was equal to that which could be opposed to it.

Thus, it does not frequently happen that either the *personal* or *material* of war can be reached to any important extent by parties from our ships; and when they have been employed by any of the maritime powers of Europe against each other or against the United States, their operations have been desultory, and often followed by deplorable evils: it is only necessary to refer to the expeditions of the English

on our own coasts during the war of 1812 to illustrate the truth of the *general proposition*. Our own maritime expeditions in the war with Mexico, with hardly an exception, fully attained the end proposed in each case, while humanity and a due sense of individual rights were observed by all; yet the navy may well deprecate any course of events which is calculated to withdraw it from its legitimate sphere of action on the broad Ocean, where it may protect the commerce of the country, and oppose itself fairly to the armed force of the enemy. Here it may win honor and effect great results.

Exceptional cases, however, occur where the strength of a ship or squadron may be landed with important effect. Such occurred in California in the recent war, and there are others, where the rights of the flag, of civilization, or of humanity, enforce the necessity of using a sea force for the want of other means. The offences of savage nations or islanders, and of a piratical people, may be instanced as cases requiring punishment or intimidation.

It is also within the proper scope of a navy to render assistance in the disembarkation of a land force; and, on these occasions, the boat howitzers may be useful in covering the troops; while in attacking small craft, such pieces will be indispensable. During 1823, in the West Indies, and subsequently in the

Grecian Archipelago, the cruising boats from the squadrons would have been materially aided, had they been provided with howitzers.

In the defence of our own shores and homesteads, sailors are in all respects proper and valuable auxiliaries. Wherefore, when the public service requires the ships of war to disembark the men, it is believed that these howitzers will be found serviceable, if used properly; not omitting to remember that their capacity is also unequal to cope with field-pieces of like caliber, which by their greater weight can use higher charges, and are, therefore, far more powerful, particularly in developing the effects of shrapnel. This is obvious, if it be considered that a 12-pdr. gun will well bear four pound charges, while the howitzers are lively with one-fourth of the quantity of powder.

The absence of a limber and its caissons will also tend to impress a recollection of the auxiliary character of a naval force when landed; and, as before stated, if the operation be conducted within the legitimate sphere pertaining to it, this appendage will be found useless and cumbersome, and the want of it will answer as a proper check on any attempt to go beyond due limits, and thus expose the party to certain defeat or capture.

Should circumstances ever arise which would render the employment of seamen indispensable in the field,

as in California, then the proper authorities will take care to provide for the occasion.

But in any case, it is not to be expected that seamen are to match good infantry; and to train them to perform more than the part of auxiliaries in military affairs, would be probably to sacrifice much of their usefulness in sailor-craft.

APPENDIX.

As a knowledge of the means employed by others may be considered next in importance to a knowledge of our own means, the following account of the Boat Armament of a principal maritime power is appended to this memorandum.

It has the advantage of official authority, being extracted from the "Aide Mémoire Navale," issued in 1850, by the sanction of the Minister of Marine.

BOAT ARMAMENT OF THE FRENCH NAVY.

UNTIL recently, the French system of armament for boats was as follows :—

	18-pdr. Carronades.	12-pdr. Carronades.	Swivels.	Blunder-busses.	Mountain howitzers.
Ships of 82 and razees . . .	1	1	4	8	2
24-pdr. frigates		2	4	8	2
18-pdr. frigates, and razees of 28		1	4	8	2
Corvettes and brigs of 18 and 16		1	4	6	1
Gun brigs			4	4	
Transports over 380 tons . . .			4	6	
	lbs.	lbs.	lbs.	lbs.	lbs.
Weight	1274	840	187	44	220
Charge	2.2	1.43	.29	.11	.6

It is stated (Colonel Charpentier) that the mountain howitzer was introduced into the French naval service by the Prince de Joinville; during the expedition under Admiral Baudin to Vera Cruz, he had the opportunity of experiencing how useful even so trifling a piece may be.

The present system of boat armament as re-organized by a general order of 27th November, 1849, is thus :—

	Number of boats.	BRONZE HOWITZERS* AND BOAT-CARRIAGES.			Field-carriages for mountain 12.
		15-cent.	New 12-cent	Mountain 12.	
Line-of-battle Ships,					
Launch . .	1	1			
1st cutter . .	1	1			
Barge . .	1			1	
2d cutter . .	1			1	1
Other cutters .	2			1	
1*st class Frigates,*					
Launch . .	1	1			
1st cutter . .	1	1			
Barge . .	1			1	
2d cutter . .	1			1	1
Other cutters .	1			1	1
2*d and 3d class Frigates,*					
Launch . .	1	1			
1st cutter . .	1		1		
Barge . .	1			1	
2d cutter . .	1			1	1
Other cutters .	1			1	1
1*st and 2d class Corvettes,*					
Launch . .	1		1		
1st cutter . .	1			1	1
Barge . .	1				
2d cutter . .	1				
Other cutters .	1				
3*d class Corvettes,*					
Launch . .	1		1		
1st cutter . .	1			1	1
2d cutter . .	1				
1*st and 2d class Brigs,*					
Launch . .	1		1		
1st cutter . .	1			1	1
2d cutter . .	1				

* The 15-cent. may be considered as equivalent to our 24-pdr.; the 12-cent. to our 12-pdr.

Hence it appears that carronades, swivels, and blunderbusses have been laid aside, and an entire system of howitzers substituted. A desire having been manifested by some officers of rank to include the field howitzer of 16-cent., a special commission was ordered to consider the proposition; the report was unanimously against the piece, as too heavy for boats.

The new howitzer of 12-cent. or 12-pdr., created particularly for boat service, is a necessary intermediate between the 15-cent. or 24-pdr. of 581^{k} and the mountain 12 of 220^{k}.

It will be perceived that the mountain 12 is the only piece intended to be landed, and to this end it has the same field-carriage as that used in the army. The "Aide Mémoire Navale" (568) remarks, in connection with this subject:—

"If the bronze howitzer of 15-cent. be definitively adopted (which has since been done by the order of November, 1849), it will probably be inconvenient to put on board its field-carriage, as proposed in 1842 by the *Conseil de travaux*. It would be too cumbersome in the ship, and would be of no great service in landing by reason of the difficulty of drawing it by hand, and of disembarking it. The mountain carriage in use is fully sufficient. It has the advantage, from its ease of movement and manœuvre, of being able to penetrate sufficiently into the interior of a country."

The system of boat armament in the two navies may be compared thus :—

		24-pdr.	Medium 12-pdr.	Light 12-pdr.
		Inches.	Inches.	Inches.
U. S. Navy	Diameter bore	5.82	4.62	4.62
	Weight lbs.	1300	760	430
		Inches.	Inches.	Inches.
French Navy	Diam. bore	5.96	4.75	4.75
	Weight lbs.	1280	660	220

The French calibers are greater than the American by a very trifling quantity. Their weight of piece rather inferior, considerably so in the medium 12-pdr., and much more so in the light 12-pdr.

In landing for field operations, there is only the 3d class piece provided on one side, and on the other the pieces of the 2d and 3d class, though the latter are not so numerous.

Two ammunition boxes are allowed to the Mountain 12 on shore, containing each seven shells and one stand of canister.

THE END.

BUREAU OF ORDNANCE AND HYDROGRAPHY,

UNITED STATES NAVY.

SYSTEM

OF

ARMAMENT FOR BOATS.

(EXPERIMENTAL DEPARTMENT.)

PART SECOND.

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